CEREAL SCIENCE *today*

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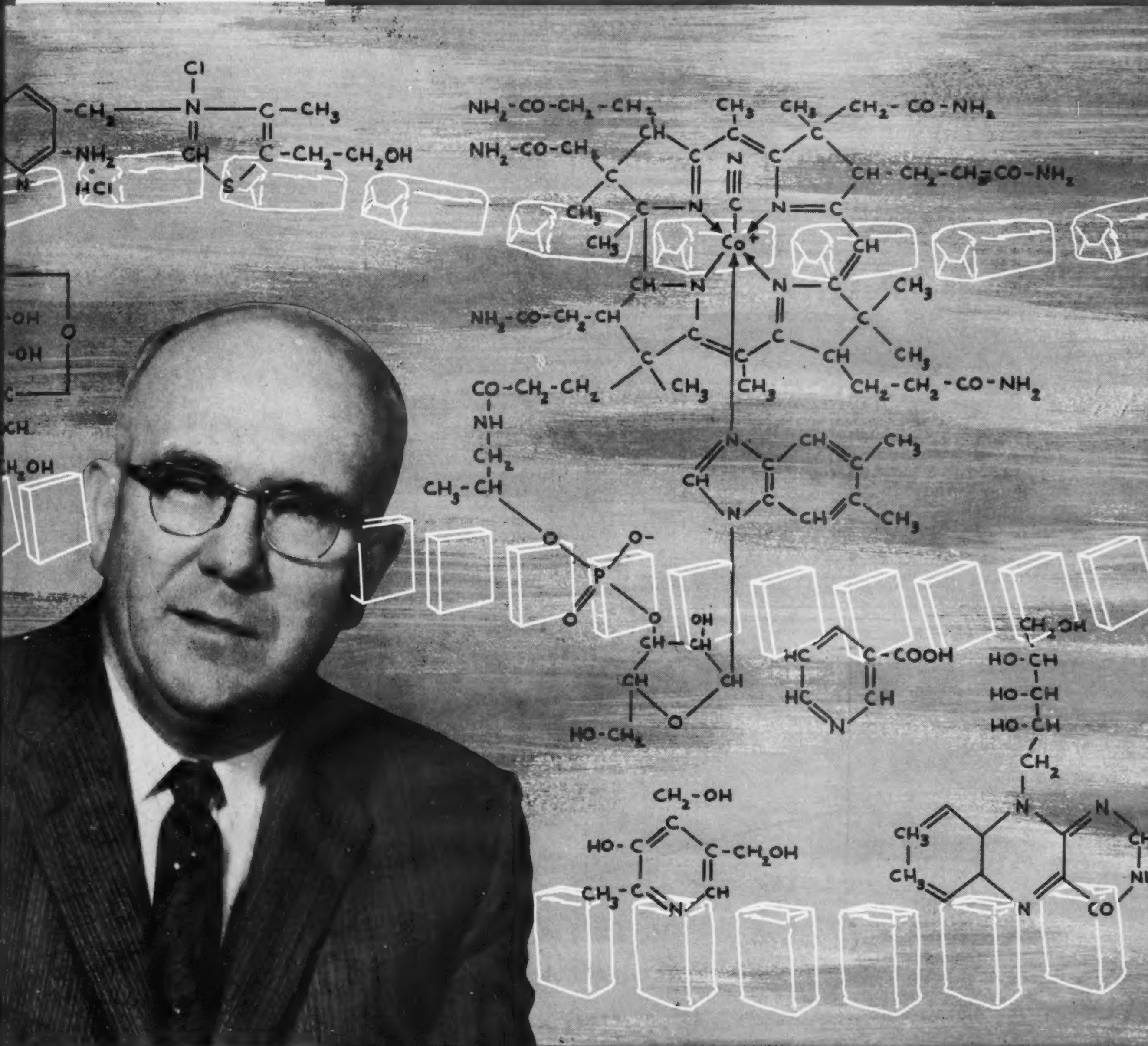

AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

AACC CONVENTION REPORT

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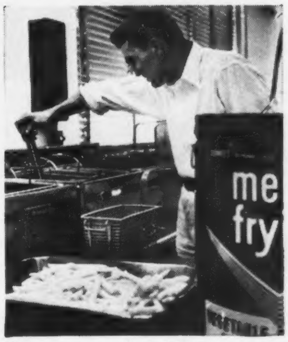

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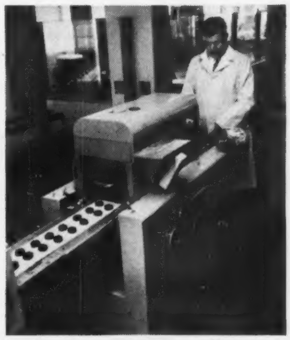

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FAMOUS FOODS

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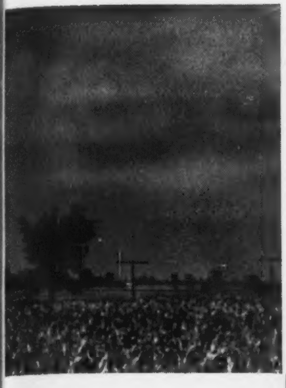

CEREAL SCIENCE *today*

FEATURES

DEPARTMENTS

STAFF

COVER: Clinton L. Brooke, Merck & Co., new president of the AACC.

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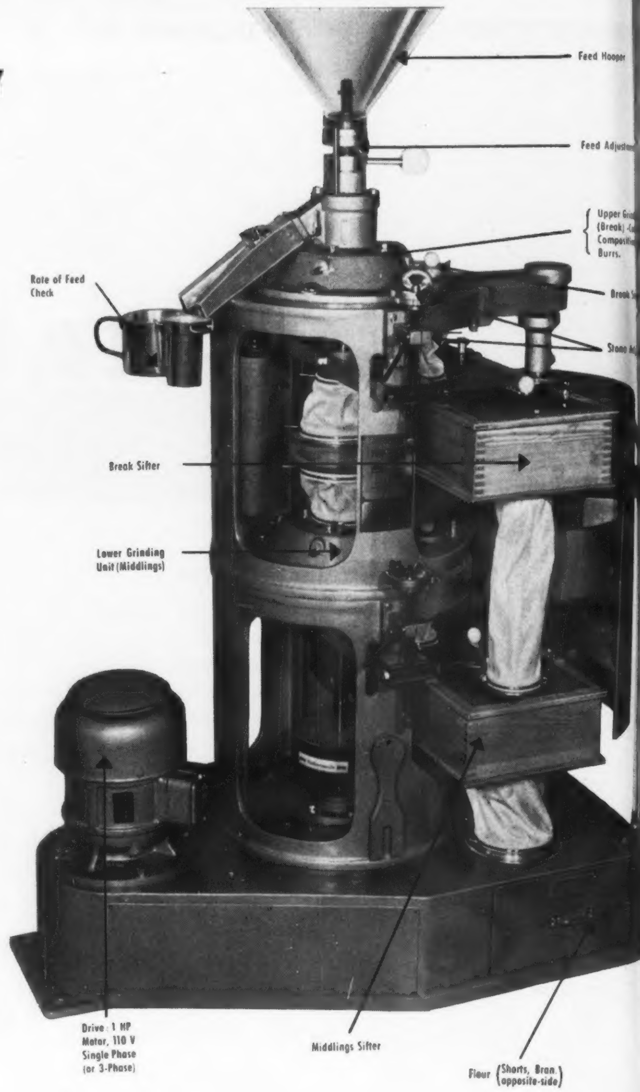

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Editorial

ANOTHER HIGHLY SUCCESSFUL annual meeting of the American Association of Cereal Chemists is now history. An opportunity for careful study of many of the papers on the technical program will be provided as these are published in forthcoming numbers of CEREAL CHEMISTRY and CEREAL SCIENCE TODAY. In this issue you will find pictures and news of the Cincinnati meeting, including a report on an important business session. Especially deserving of careful reading are the President's address and the talks of guest speakers at the opening session.

These speeches afford cereal chemists an opportunity to see themselves and their accomplishments as they appear to men who are uniquely qualified to discuss the past, present and future of the cereal processing industries. In these talks, there is a challenge to the cereal chemist to solve or participate in the solution of important problems. To do this most effectively, the chemist must not allow his interests and his abilities to be confined within the four walls of a laboratory. He must do more than develop techniques, obtain and record data, important as these may be. He needs to become a sagacious student of the industry he serves, its raw materials, processing methods, products, and customers' needs. Others may have some concept of what the cereal chemist can do, but no one can provide better direction for his activities than he himself when he combines his scientific knowledge with a thorough understanding and appreciation of the needs of the cereal industries and the public they serve.

Knowing the answers is not enough. The chemist who cannot effectively communicate his findings to those able to put that knowledge to work will find it difficult to attain the status he may think he deserves.

P. E. RAMSTAD

AACC HEAD DISCUSSES CEREAL IMPORTANCE IN THE

Presidential Address

By William B. Bradley, American Institute of Baking, Chicago, Illinois *

I HAVE FACED no more difficult task than that of attempting to outline the "president's address." To me the title listed in the program promises a learned, philosophical discussion of the relation of our specialty to the welfare of mankind. Were I given absolute freedom in the thoughts I might express this morning, my words would sound so much like Dr. Zeleny's president's address of last year that I would be subject to suit for plagiarism. As a consequence, I feel impelled to discuss briefly a number of unrelated things, each of which I believe to be of interest to our members.

Last year, Dr. Zeleny stated, "Although we are the American Association of Cereal Chemists, we must not confine our thinking and our efforts to the problems of one country. We are truly an international organization." I believe that most of us have considered either consciously or unconsciously that the A.A.C.C. has been an international organization since its inception. At the moment, we have members in twenty-six countries other than the United States. Subscribers to CEREAL CHEMISTRY or CEREAL SCIENCE TODAY, or both, are located in sixty-eight countries of which eight are behind the iron or bamboo curtains. Our monograph on grain storage has been translated into Russian and published in that country without regard to copyright.

It would appear that our fellow scientists in many foreign countries recognize the A.A.C.C. as an international organization and that we speak (through our publications) in a language common to all and offer assistance not just to cereal chemists in the United States but to our fellow scientists throughout the world. It is regrettable that, although distances have shrunk as a result of our modern transportation facilities, more scientists from other countries are unable to attend our annual meeting.

If the world's diplomatic fraternity had a common purpose, as diligently pursued as the purpose which awards us the privilege of referring to the A.A.C.C. as a scientific society, and had the common language spoken by scientists regardless of their native tongue, there would be greater understanding between nations and less tension throughout the world.

Our growing world-wide service to those who are interested in cereals as human food is heartening. In most countries, other than our own, some cereal food constitutes the major portion of the diet. In such countries, the populations look to their native bread, rice or maize as the prime source of nutrients. Therefore, the contributions of our publications to the knowledge of the composition and conversion of cereals into palatable foods have even greater importance to man's welfare in other sections of the world than in the United States where our economic status permits us to consume high-priced sources of nutrients beyond our requirements, and our high ratio of productive land to population permits such extravagance.

As evidence of the growing unimportance of cereal foods in the United States are the data on the consumption of food since 1909. In 1909, flour and cereal products furnished 37.2% of the nation's calories. In 1956, flour and cereal products represented only 21.1% of the total caloric intake.

In a country of huge agricultural surpluses, the tendency to low-rate grains as human food is readily understood. The less efficient use of grain as feed bolsters the agricultural economy. This poor rating accorded cereal foods has been made possible to a great extent by the lethargy within our own industries. Competitive food industries have been quick to explore the value of their products in nutrition. They have sponsored nutrition research through grants-in-aid at most of the qualified universities throughout the country. As a result, those responsible for the investigations have waxed enthusiastic over the foods they have studied because their performances in animal experiments or human investigations has revealed their desirable attributes. The literature is replete with investigations showing the value of competitive food items. The cereal industry, on the other hand, has sponsored little research to determine the role of its products in nutrition. Most of the nutrition investigations on cereal products have been undertaken to demonstrate the value of added supplements, many of which greatly increase production costs or fail to meet with consumer acceptance.

* Presented at the 43rd annual meeting, Cincinnati, Ohio, April 8, 1958.

As a result, grains are not emphasized as necessary foods in the human dietary. That enthusiastic support could be forthcoming is shown by the results of the investigations of Drs. McCance and Widdowson. These investigators, who set out to determine the nutritional differences in wheat flours of varying extraction rate, were so impressed by the performance of children on a diet consisting mainly of wheaten products, that they undertook to review the literature on the subject of bread to determine why certain breadstuffs "enjoyed" such a poor reputation. The book, "Bread — White and Brown" is the result of this literature survey and reflects the enthusiasm that qualified investigators can display toward cereal foods when they have had an opportunity to investigate them. More well-planned studies to determine the value of cereal foods in human nutrition could be extremely productive. The success of the enrichment program attests to the willingness of the cereal industries to accept recommendations requiring changes in their products when the recommendations are based on good evidence of need and when they are compatible with consumer acceptance.

The shortening manufacturers have met the recent criticism of their products in a realistic manner — they are sponsoring numerous investigations to determine facts which are needed to guide themselves and the consumer. I would venture to guess that, while these facts are being obtained, they have investigated the possibility of modifying their products should the evidence indicate that there is need for modification. This, I know, has been done by the baking industry.

The Department of National Health and Welfare of the Dominion of Canada has formulated a regulation governing protein claims which may be made for individual food items. The food is scored as a source of protein by multiplying the protein concentration of the food by a reasonable daily intake of the food in grams. The product is then multiplied by the protein efficiency ratio of the protein contained in the food. The regulation prescribes the technique for determining the protein efficiency ratio using weanling male rats. If the protein rating given to the food using this procedure is less than 20, no label statement or advertising statement shall refer to the protein of the food except in an approximate analysis which may be employed. If the protein rating falls between 20 and 40, claims may be made that the food is a good dietary source of protein. If the rating is 40 or more, claims may be made that the food is an excellent dietary source of protein or that it contains high-quality protein.

This regulation effectively eliminates protein claims for the usual cereal foods. Enriched bread, for instance, is reputed to have a protein rating of 12.6, whole wheat bread a protein rating of 19.6.

Personnel of our own Food and Drug Administration have expressed concern over exaggerated claims pertaining to protein made in this country. I hope that they do not go to the extreme of completely negating the important role which cereal proteins have played in the human diet, which will result from the Canadian regulation.

Hearings are scheduled to resume this month before the Health and Science Subcommittee of the House Interstate and Foreign Commerce Committee at which testimony will be taken pertaining to proposed amendments to the Food and Drug Law. Several bills have been introduced, each of which, if adopted, would provide the Food & Drug Administration with more authority over chemical additives to food.

Most of us here represent the food industries which are on record as favoring legislation covering this important subject. This has been expressed by the adoption, as early as 1952, of statements of principles by a number of food industry associations. The important aspects of these principles are that they are agreed on the two basic principles: (1) that the manufacturer or user of any new additive to food shall adequately pretest such additive for its safety for human consumption, and (2) that the results of this pretesting shall be approved by the Food and Drug Administration before a new additive is permitted to be used in or on food.

Being chemists, we are aware of the potentialities of chemical substances. I believe we all recognize the need for strengthening the Food and Drug Law to cover chemical additives. Its present weakness presents a potential hazard to the consumer and fosters poor public relations for the entire food industry because of the gross exaggerations made by writers on this subject.

In order to conclude this rambling discussion, I would like to again refer to the problem which faces the shortening manufacturers. During the past year, there have been many publications in this area. They appear to indicate, for the most part, that a high consumption of saturated fats raises blood cholesterol while the same magnitude of consumption of fats in the form of unsaturated oil, such as corn oil, lowers blood cholesterol.

At least one group, however, have reported that blood cholesterol is unaffected by high fat intake in a diet which provides a moderate protein intake even when the dietary fat consists of saturated fats such as butter. The investigators who made this report have indicated that the epidemiological evidence used by some investigators to substantiate their claim that high fat intake is accompanied by a high rate of atherosclerosis and coronary heart disease, is also applicable to protein intake because in those areas where fat intake is high, protein intake is high also.

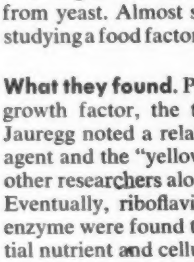
Without intending to enter into this controversy, I would like to put forth the thought that perhaps epidemiological evidence could be interpreted as favorable towards the cereal industry. In those countries where fat intake and protein intake is nominal, the intake of some cereal product, rice, corn, or bread made from one of the small grains, is high. The epidemiological evidence could be interpreted to indicate that cereal foods protect against atherosclerosis and coronary heart disease with as high a degree of correlation as is obtained between fat or protein intake and these disease conditions.

The Vital Story

A Quick History. Independent investigators, working separately to unlock several of nature's doors, sometimes open up unsuspected relationships. This happened with vitamin B_2.

Investigations. About 25 years ago, several groups, notably Warburg's, were investigating a "yellow enzyme" obtained from yeast. Almost simultaneously other investigators were studying a food factor that aided growth of laboratory animals.

What they found. Proceeding with chemical analysis of this growth factor, the team of Kuhn, György, and Wagner-Jauregg noted a relationship between the growth-producing agent and the "yellow enzyme." Their findings, and those of other researchers along similar lines, were published in 1933. Eventually, riboflavin and an essential part of the yellow enzyme were found to be identical and the unity of an essential nutrient and cellular metabolism was established.



Isolation of pure riboflavin was achieved by Kuhn and his co-workers, and by Ellinger and Koschara, in 1933.

Nomenclature. Known in the United States as riboflavin, this vitamin has also been called lactoflavin, ovoflavin, hepatoflavin, and vitamin G.

SYNTHESIS

By 1935, two eminent chemists, working separately, had synthesized riboflavin, practically in a dead heat. Prof. Paul Karrer of the University of Zurich, a collaborator of the Hoffmann-La Roche Laboratories, produced the first successful synthesis. Five weeks later Richard Kuhn of Germany announced his synthesis of the vitamin. Prof. Karrer subsequently shared the Nobel Prize in Chemistry for his work in vitamins and carotenoids.

The Karrer synthesis forms the basis for chemical processes in widespread use today by Hoffmann-La Roche and other leading manufacturers throughout the world. Riboflavin is also manufactured today by fermentation methods.

CHEMICAL AND PHYSICAL PROPERTIES

Riboflavin is yellow, slightly water-soluble with a greenish fluorescence and a bitter taste. Its empirical formula is $C_{17}H_{20}N_4O_6$. Vitamin B_2 produced by the Roche process is identical in every way with that occurring in nature.

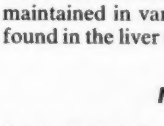
How does vitamin B_2 work? Riboflavin is a vital part of nature's chain of reactions for utilization of carbohydrate energy. It has been found to be a constituent of many enzyme systems and is thus intimately connected with life processes. It is probably required by the metabolic processes of every animal and bird as well as by many fishes, insects and lower forms of life. (In certain animals, however, the requirement may be synthesized by bacteria within the intestine.)

In the cells riboflavin goes to work attached to a phosphate group. This substance, known as riboflavin-5′-phosphate or flavin mononucleotide, may in turn be attached to still another essential substance, adenylic acid, forming flavin adenine dinucleotide. Either nucleotide then is attached to protein, thereby forming an enzyme, and takes its part in oxidation-reduction reactions.

Requirements in Human Nutrition. As we have seen, vitamin B_2 is essential to life. We have no special storage organs in our bodies for this vitamin, although a certain level is maintained in various tissues, with relatively large amounts found in the liver and kidneys.

MEASURING METHODS

In the beginning, riboflavin activity was described in "Bourquin-Sherman units" and requirements were thought to be very small. Subsequent research showed otherwise. Milligrams of weight became the unit and the Food & Drug Administration of the U. S. Dept. of Health, Education & Welfare established (July 1, 1958) a minimum daily requirement of 1.2 mg. of riboflavin for all persons 12 or more years old. For infants it is 0.6 mg. These requirements are designed to prevent the occurrence of symptoms of riboflavin deficiency disease. The minimum daily requirement for this vitamin for children from 1 to 12 years is 0.9 milligram.



Recommended allowances. The Food & Nutrition Board of the National Research Council has recommended the following daily dietary allowances of riboflavin, expressed as milligrams. These are designed to maintain good nutrition of healthy persons in the U. S. A.

Men	1.6	
Women	1.4	
" (3rd trimester of pregnancy)	2.0	
" (Lactating)	2.5	
Infants, 1-3 months	0.4	
" 4-9 "	0.7	
" 10-12 "	0.9	
Children, 1-3 years	1.0	
" 4-6 "	1.2	
" 7-9 "	1.5	
	Boys	Girls
Adolescents, 10-12 years	1.8	1.8
" 13-15 "	2.1	2.0
" 16-20 "	2.5	1.9

# of VITAMIN B_2 *by* Science Writer

(Riboflavin)

Deficiencies of vitamin B_2 appear in several ways in human beings. The eyes, the skin, the nerves, and the blood show the effects of too little riboflavin. Laboratory animals have demonstrated that a riboflavin-deficient diet can cause death of adults and can slow or stop growth in the young. Female animals, deprived of riboflavin in the diet, may produce offspring with congenital malformations.

Medical uses. To overcome and control deficiencies in human beings, physicians have pure riboflavin available for administration by injection or orally, by itself or with other "B" vitamins or multi-vitamin-mineral combinations.

How do we get our daily riboflavin? Vitamin B_2 has wide distribution throughout the entire animal and vegetable kingdoms. Good sources are milk and its products, eggs, meats, legumes, green leaves and buds. Whole-grain cereals have significant but not large amounts of riboflavin.

ADDITION TO FOODS

Cereal foods play a large part in our diet. To produce the white flour almost all of us want, millers are obliged to remove parts of the wheat that contain much of the grain's riboflavin and other nutrients. In addition, cereal grains are not rich sources of riboflavin. Millers meet this problem by *enriching* the grain foods for which federal standards exist with vitamins B_1, B_2, niacin and the mineral iron. In the case of vitamin B_2, however, they do more than *restore* the processed food to its natural riboflavin level; they *fortify* the food with enough of this essential vitamin to make it nutritionally more valuable than it was in nature.

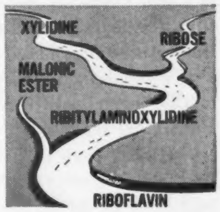
Acting to protect the good health of millions of Americans, bakers and millers adopted *enrichment* of white bread and white flour in 1941. Since that time, other foods, such as macaroni products, corn meal and grits, farina, pastina and breakfast cereals have had their food value increased by enrichment with pure riboflavin and other vitamins and minerals.

When enriching, fortifying or restoring, food manufacturers add the necessary quantity of riboflavin (and other vitamins and minerals) to the food during processing, so that the finished product meets federal, state, and territorial requirements or contributes to the consumer an amount of the vitamin that dietary experts believe significantly useful.

PRODUCTION

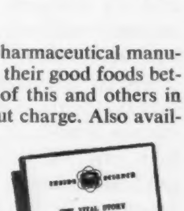
Prof. Karrer's synthesis of riboflavin was a laboratory success. Adapting the process to commercial production, however, demanded original thinking by chemists at Hoffmann-La Roche. The production of riboflavin by chemical synthesis requires the production of ribose, a rare sugar, at an early stage in the process. This special sugar must be made inexpensively if the synthesis is to be practical. Sugar chemistry is a difficult matter. In a brilliant piece of work, the Roche chemical experts developed a method to produce ribose on a commercial scale by an electrolytic process, thus overcoming a most troublesome problem. Subsequently, Roche chemists developed the first practical synthesis for riboflavin-5′-phosphate, identical with natural flavin mononucleotide.

Picture three streams joining to form a river and you have a simplified idea of the Roche process for synthesizing vitamin B_2. O-xylene and glucose are processed separately to form xylidine and ribose respectively. These are joined to form ribitylxylidine, which is then converted to ribitylaminoxylidine. Starting separately with malonic ester, which is processed through intermediate stages to alloxan, the third "stream" is then joined with ribitylaminoxylidine to form riboflavin. Purification occurs at each step of the synthesis. Riboflavin 'Roche' equals or exceeds U. S. P. standards.



By the tons. So efficient is the Roche process that pure riboflavin is produced *by the tons* for use in pharmaceutical products and processed foods. An interesting development by Roche is the production of riboflavin in different forms related to the method of end use. 'Roche' Regular riboflavin U. S. P. is especially useful in dry enrichment premixes, powdered dietary supplements, pharmaceutical tablets and soft gelatin capsules. 'Roche' Solutions type is preferred for the manufacture of solutions having low concentration. 'Roche' Riboflavin-5′-Phosphate Sodium is a highly and rapidly soluble riboflavin compound favored for all pharmaceutical liquid products and some tablets, lozenges, and capsules. It has a more pleasant taste than the bitter U. S. P. riboflavin.

This article is published in the interests of pharmaceutical manufacturers, and of food processors who make their good foods better using pure riboflavin 'Roche.' Reprints of this and others in the series will be supplied on request without charge. Also available without cost is a brochure describing the enrichment or fortification of cereal grain products with essential vitamins and minerals. These articles and the brochure have been found most helpful as sources of accurate information in brief form. Teachers especially find them useful in education. Regardless of your occupation, feel free to write for them. Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 1956 Bourdon St., St. Laurent, P. Q.



THE FUTURE OF THE

Wheat Milling Industry

By John P. Snyder, Jr., Pillsbury Mills, Inc., Minneapolis, Minnesota*

IT WAS A PLEASURE for me as a representative of production to be asked to speak to the Cereal Chemists today, for in our industry the chemist and the production man have to, and do, work very closely together; furthermore, there are potentially great contributions that the field of cereal chemistry can make to our future. In recent years, the relationships between production personnel and chemists have become more important. I believe that success in the future depends on this relationship's reaching new heights.

I've been asked to talk on The Future of the Wheat Milling Industry. Rather than turn to a crystal ball and say, "Here's what the industry will be like in 50 or 100 years," I choose to review rather briefly our industry, pointing out where we are now, what the trends appear to be, and what the future could hold for us based on these trends.

Raw Material

First let's talk about wheat, our raw material. The halls of Congress and the places where the farmers meet in the wheat belt are filled with countless solutions to our surplus problem, and it's extremely important to our industry and to the farmer that some equitable solution be found to this problem. Normally we would expect that the needs of our expanding population would, at some future time, take care of this surplus, but the gradual decline in the per-capita consumption of wheat flour products works against this. The fact that the price support system has guaranteed a price to the farmer on any kind of sound wheat has meant less emphasis on the growing of quality wheats that are suitable for milling and baking, even though premium prices are paid for the better wheats at the grain markets. The tendency of farmers to plant varieties that yield well and that are resistant to weather and blights further reduces the consideration of baking and milling qualities. Crop conditions in foreign countries and governmental export subsidy programs can, and will, have a big effect on the size of our surplus. For example, the United States exported 221 million bushels of wheat in 1955, and in 1956 this jumped to 408 million bushels, primarily due to poor crops

in places like France, Germany, and Belgium.

None of us are wise enough to say what the wheat supply situation will be in the future. However, I am sure that there will have to be greater emphasis on the growing of improved varieties of wheat that are more suitable for milling and baking. This will require even a greater degree of cooperation between the millers and bakers and the agronomists and cereal chemists than exists at present, and I do not mean to overlook the cooperative work that is now carried on by crop improvement associations, universities, federal laboratories, etc.; I think there must be more. The grain industry must do everything possible to make its food products more appealing and palatable to increase consumption, and I think this effort must start right at the beginning with the kind of wheat that is grown.

Transportation

The transportation and handling of wheat from the producer through the country and terminal elevators to the mills is an area of our industry where changes have been occurring, but where a lot more has to be done to bring the costs down. No longer can we be satisfied with the costly and time-consuming method of unloading wheat wherein men scoop it out of the boxcar, using inefficient methods and involving working conditions that are more and more unacceptable. Modern facilities are needed where grain is handled in any volume. Car dumps are very expensive, so justified only for large volumes. Pneumatic systems are convenient but somewhat costly to operate. In the past few years we've seen a rapid swing to the hauling of wheat by truck. To take advantage of these lower transportation costs, more truck-dumping facilities will be needed. Somehow or other we need to improve the entire movement of wheat from the growing field to the mill. Too much of the total cost of flour is in the cost, storage, and transportation of the raw material.

Products and Markets

When we speak of the future of the wheat milling industry, I think "future" to almost everyone means: what will be the demand and the market

* Presented at the 43rd annual meeting, Cincinnati, Ohio, April 8, 1958.

for the products of this industry? Let's see if there are any apparent trends and what they might indicate for the future.

Millers are sometimes prone to use the words "overproduction" and "excess capacity," but it is probably more correct to say that the milling industry problem is purely and simply one of underconsumption. In 1910, in the U.S. the per-capita consumption of wheat flour products was 211 pounds; for 1958, the initial forecast is 118 pounds — a 44% decline over this 47-year period. In this same period of time our population increased about 85%, from 92 million people to over 172 million people at the present time. The total consumption of flour in the U.S. went up about 2% in this period of time — only because of our tremendous population increase.

Let's take a more recent look at flour consumption. In the 5-year period 1953 through 1957, our population increased by over 11 million, yet the total annual domestic use of flour stayed almost constant at about 205 million cwt. during each of these past 5 years. Some experts say our population will reach 228 million in 1975. What will the flour market be at that time?

Before I even attempt to answer that, I think we had better look at some of the things that have brought about the decline in the per-capita consumption of wheat flour products. This decline can be attributed in part to a complexity of causes:

1. The shift from home baking to commercial baking, which to the consumers involved changes in flavor, aroma, and personal associations of baking in the home.

2. The introduction of hundreds of new foods and new forms of food in the grocery trade—foods in canned, frozen, fresh, and prepared forms unheard of 20 years ago or even 10 years ago. In competition with this wider choice of nutritionally recommended foods, bread loses its importance as the "staff of life" and an ingredient for every meal. Looking at the consumption of various foods per capita by weight, we see that grain products had 19% of this market in 1910 and only 9.8% in 1956. All other food categories, with the exception of potatoes, showed gains which collectively cut the baker's and miller's shares in half.

3. Changing patterns of American life — in which people require fewer energy foods, as machines replace or supplement manual labor. I think everyone recognizes that our eating and living habits are quite different now from what they were 10 and 15 years ago.

4. The attacks of food faddists and quacks, who have claimed that white flour and its products can lead to almost every kind of degenerative disease.

5. The popular misconception that breadstuffs are peculiarly fattening. Although accepted as sources of energy, wheat flour foods generally go unrecognized as important sources of protein, of calcium (since they are frequently made with milk), and of the nutrients of the enrichment formula. There is increasing evidence that the protein in wheat flour may be much more nutritious than has heretofore been suspected. If true, here is an opportunity to reverse the nutritional picture that we face today. Here is a field where cereal chemists can make a great contribution to our future.

6. The failure on the part of producers of wheat products to educate, promote, and advertise as much as others have, such as the dairy industry, and the citrus fruit and meat industries has caused wheat products to lose recognition.

7. Breadstuffs have lost prestige and are recognized as a subsistence food rather than as an interesting, palatable food associated with a high standard of living.

It is generally conceded that the leading factor behind this decline in per-capita consumption has been the competition from other foods for the consumer's food dollar. Many of these other foods have shown phenomenal sales increases in past years. Between 1910 and 1956, ice cream sales went up nearly 1600%, and the sale of cheese advanced 237%. Between 1910 and 1956, citrus fruit sales went up 285%. These and other foods have outmaneuvered the milling and baking industry through more and better merchandising and advertising. Foods other than flour products have been made to appear more appealing, more glamorous, more nutritional, more fashionable, and representative of a higher standard of living.

Let's take a quick look at what has happened in our three flour markets — family, bakery, and export.

Family. Currently, the total domestic annual family flour market is slightly over 40 million cwt. — a decline from 165 million cwt. in 1910. With a continued decline in home baking, this market has continued to go down in recent years; and with the ever-increasing demand for convenience foods, I think it is unrealistic to predict that this trend will reverse itself in future years. Since the end of World War II, the rapid growth of many different baking mixes has helped to stem this trend away from home baking, yet the flour involved in all these mixes is a relatively small percentage of the total flour consumed.

The growth of other foods in the highly competitive consumer market is quite clear when we see that the average supermarket now handles 5200 items as compared to 867 items in 1928.

Bakery. Looking at the bakery flour market, we see that the consumption of flour by bakeries advanced from 30 million cwt. in 1910 to about 155 million cwt. a year at present. It's also interesting to note that there are approximately 22,000 commercial baking establishments in the country, but that 7700 of them, or 35%, do 91% of the business. We know that commercial baking is becoming more and more concentrated in a relatively small group of larger bakeries. These bakeries are rapidly making their operations as completely mechanized as possible. This puts greater pressures on flour millers and their cereal chemists to produce a flour that is completely uniform — a flour whose shop performance can be absolutely predicted and a flour that will benefit the baker by greater yield of baked goods per 100 pounds of flour.

In commercial use, the institutional or eating-out market, is of growing importance. Sales in this market advanced from 4 billion dollars in 1936 to 16 billion dollars now, with the industry predicting annual sales of 32 billion within the next 20 years. We must make certain that this market uses products of the wheat milling industry.

Export. Export business represents our third major market. Annual exports of flour rise and fall depending upon wheat crop conditions in foreign markets and government subsidy programs, not only in the U.S. but also in other countries, such as

France and Germany. The worldwide effort towards national industries will have a marked effect on the amount of flour business we do abroad. Flour mills are being built in many foreign countries, and in many places it's quite evident that it is not an economical operation. As an example, Venezuela until recently had no mills. All flour was imported. Now it has at least four running and three large ones building. As an example of how this market fluctuates, the United States exported 15 million cwt. of flour in 1939; this jumped to 76 million cwt. in both 1947 and 1948 when flour was in short supply in many foreign countries. Exports gradually declined to a low of 17 million cwt. in 1954, and in 1957 had gone up to over 26 million cwt.

Recently the export advisory committee of the Millers' National Federation recommended a "long-range program pointed towards maximum freedom of opportunity for the expansion of foreign markets." They went on to say that "present restrictions, embargoes, quotas, duties, etc., seriously jeopardize such expansion and encourage the construction of flour mills in other countries, many of which do not and cannot raise any significant quantities of wheat."

They say further that "If our industry is to enjoy maximum benefits from increasing world per-capita flour consumption, as well as population increases abroad, it must have access to all possible markets." Some of these markets are important and underdeveloped; in spite of exports there are still millions underfed in the world.

Summarizing markets: *Family* down. *Bakery* up.

Processing and Handling

Now that we've covered some of the things that are happening in our flour markets, let's look at what is happening in the processing and handling of flour.

As you in the flour industry know, very few new flour mills have been built in this country in recent years, although many have gone up in foreign countries. In the U. S. during the last 27 years, 308 mills closed. These closings, combined with other capacity changes, have resulted in daily capacity being reduced 248,925 cwt. The cost of construction, weighed against the return on our products, just doesn't justify the expenditure of a new mill. There has, however, been a lot of activity in the area of mill modernization, and I know that we will see a continuation of that activity. In some cases, entire mills have been modernized; in other cases there has been gradual modernization, adding new roller mills, purifiers, sifters, and pneumatic conveying systems, automatic controls and weighers, and better packing machinery, as the returns on capital investments proved attractive. There have been great strides made in the area of bulk handling of mill products. As more of the bigger bakeries install bulk storage facilities, there will be a need for more and more bulk storage and loading facilities at mills and distribution points. Bulk storage requires a large capital investment, which presents a problem for small mills. The trend toward bulk is moving so rapidly that in a very few years almost all domestic bakery flour will be handled in bulk.

Our industry is noted — perhaps unfavorably so — for the fact that no major changes occurred in our production processes for many years after the steel rollers replaced the millstones and purifiers were introduced in the 1870's.

Now, as you know, a major innovation has made its appearance in our industry as a result of the work done in recent years on air separation or air classification of flour. There has been a great deal of interest in this subject in the last few years, not only in this country, but also in foreign countries. There are now on the market several different machines for air classification. About a year ago, Pillsbury Mills announced what we call a "turbo milling process." In this talk I will not describe this process or try to cover any of the technical aspects, because the subject was covered early in March at the Bakery Engineers Convention. Furthermore, there will be an article on air-classified fractions of flour in the May issue of CEREAL SCIENCE TODAY. Similar new processes permit the production of flours that are particularly suited for various baking purposes. Developments of this kind imply a high potential for new products and broadened markets of great benefit to the future of our industry; it should help to relieve the technical vacuum which exists in our industry.

Cereal Chemists

Up to now, I've attempted to review the major areas of the wheat milling industry, and in a general way develop some ideas as to the future of our industry, based to a large extent on the trends that are apparent. I'd like to get more specific now and cover some of the problems and opportunities that are closely related to you as cereal chemists. Much of what I want to bring out was well stated by Mr. Atherton Bean of International Milling at the Wheat Utilization Research Conference in Peoria, Illinois, last October. He said, "More fundamental knowledge of the molecular structures and the physical and chemical properties of flour mill products and their significance relative to baking characteristics is needed. The possibilities that such findings would open for improvement in baking, in the production of new foods, or in industrial utilization could then be explored. A new system for testing wheat and flour quality might be necessary." I know that many research and scientific groups are actively working on these problems; however, it seems to me that the cereal chemists have the major role to play in developing this fundamental knowledge.

As many of you know, one of the big areas of technical deficiency in flour milling is our inability to write quantitative specifications for flour. Most other industries are able to define their products precisely in quantitative terms based on objective tests, but we mostly have to rely on a baking evaluation which is neither quantitative nor objective. Bake tests are not well standardized. They leave too much room for disagreement between supplier and customer. The trend toward mechanized bakeries where the performance of flour must be consistent with respect to time and quality adds emphasis to the need for more meaningful and adequate flour specifications. The lack of product objectives or product definition is a most frustrating situation to production people. The miller or the process engineer just doesn't really know what he is trying to accomplish in his product! I believe this is the main reason why there has been so little *process* improvement in the last 50 years.

Another point. Every year we go through a period of distress when the new crop of wheat arrives. In some

products the adjustments are more difficult than in others. The adjustments that have to be made each year are predictable to some extent on the basis of chemical and physical tests, but we still have too much trouble. We do not know how to deal directly with the problem, and as a result, we use trial-and-error methods and dilution techniques to take us through the transition. I conclude that we just do not know enough about the chemistry of the products we make.

We, and I am sure other millers, continually encounter situations in which a customer insists on using only a certain flour from a particular miller. It is claimed that nothing of our own manufacture performs satisfactorily, and yet we cannot identify and define any differences. Why does this situation occur? We just don't have a measure or an explanation for performance differences.

All sorts of phenomena occur in baking that are only partly explainable, if at all, by the chemical constants of the flours. For example, feathering in cookies; variability in crust and crumb characteristics; dough buckiness; undesirable symmetry characteristics and absorption variations, to mention a few. The solutions to these problems too often are found by trial-and-error methods involving a shift in wheat blends or the like, with no chemical explanation whatsoever.

Another illustration of technological inadequacy is the traditional dependence on protein and ash contents when talking flour specifications. I even hesitate to mention this, for as long as I have been connected with milling, I have heard the challenge put to the cereal chemist to come up with some specifications which are meaningful with respect to baking performance.

We need to isolate and identify the so-called quality factors in wheat and/or flour. We know spring wheat flour performs differently from winter wheat flour, but precisely what are the differences between the two that result in different performances? Our industry has researched proteins extensively. I wonder if wheat starches have been studied as much as they should have been. How much do we know about molecular bonds, enzymes, or lipids in flour?

Actually, it will take a lot of intensive basic reasearch before we can piece together the answers to these questions, for in most cases the answers are hidden deep in the fundamental chemistry of the components of the flour.

As I look over the subjects on the program for your meetings this week, I am encouraged for the future. However, it is my belief that as an industry, flour milling is away behind others, such as petroleum, steel and metals, and shortening, in basic knowledge and fundamental research. The key to the future of wheat milling with respect to new knowledge, new products, and growing markets rests with the chemists and other fields of research.

By-Products

I must say something about by-products, as they are important in this industry.

Here is a particular problem facing our industry today.

To produce 100 pounds of flour takes approximately 138 pounds of wheat; we end up with about 3 pounds of low-grade flour and 35 pounds of millfeed for every hundredweight of flour ground. When you relate this to the approximately 239 million cwt. of flour that was produced in the United States in 1957, you can quickly see that the industry has a tremendous amount of by-product to dispose of. Up until 1890, mill by-products were hard to get rid of and much of it went into the river or to other low-value disposition. Since then, the formula feed industry became an excellent outlet for our millfeeds, and the demand has been good enough to give us a fair recovery. In recent years we have seen a marked decline in the use of millfeeds in animal feeds. Feed manufacturers have been turning to other sources of protein, notably soybean meal, which are nutritionally advantageous at a lower cost. Between 1951 and 1957, the estimated use of soybean cake and meal increased from 5.5 million tons to 7.5 million tons. This has presented us with a disposal problem, and the low recovery, dollarwise, has affected flour costs. Low feed values have seriously cut into the net income of flour mills in recent months. In May of 1953, bran at Kansas City reached a high of $60 a ton; last October it was at a modern low of $27 a ton. On the average, $1 per ton in feed value affects patent flour 2 cents per cwt. So you can see what by-product values mean to the industry.

The real salvation lies in the development of industrial uses for these by-products, and here again, the field of cereal chemistry can make a major contribution to the future of our industry with solutions to this problem. Increasing the value of by-products will lower flour costs, which should increase flour consumption by making flour more competitive with other foods.

Food Industry

Before I close, let's take a quick look at the food industry as a whole — the nation's biggest business. In 1957, it's estimated that Americans spent 72.5 billion dollars for food, which includes over 8 billion for meals eaten away from home. In a recent article in *Nation's Business,* it was estimated that in 1975 Americans will spend, in terms of today's prices, about 105 billion dollars on food. It says further that "This doesn't mean the capsule or pill meal will be coming into favor, except possibly for future space travel. Also, food experts say there is little chance that such high-protein dishes as, say, nettle soup, sunflower cookies, or grassburgers will replace today's foods, at least during our lifetime."

They go on to say that "The food industry is looking with some certainty to these future trends:

"Sales will shoot up for processed, convenience foods.

"Competition will stiffen in practically every segment of the industry.

"More money will be spent on research for product development and improvement.

"More will be spent eating out.

"Sales of meat, eggs, fruits and vegetables, and dairy products will increase. Sales of cereals and potatoes will rise less rapidly.

"Much more money will be spent on preselling to acquaint housewives with products."

I believe it will take many new developments in the flour milling industry to maintain the per-capita consumption against the competition of other food developments.

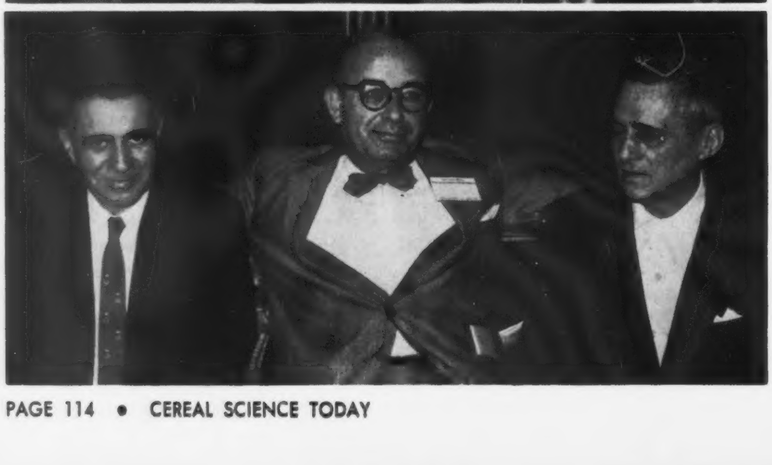
In my remarks I have not tried to forecast what the future of the flour milling industry will be. I have tried to give you some basis on which to draw your own conclusions, by cover-

(Please turn to page 122)

Reception line at the President's Reception Monday night. Left to right, James W. Evans, Program Chairman, Miss Marjorie Howe, newly elected Treasurer, James W. Pence, Secretary, D. B. Pratt, Jr., newly elected President-Elect, Mrs. Brooke and Clinton L. Brooke, President, Mrs. Bradley and William B. Bradley, retiring President, Mrs. Lakamp and Ralph C. Lakamp, Local Arrangements Chairman.

Scene from balcony of meeting room during an opening session.

S. F. Brockington leading a group of Canadians and former Canadians in the traditional "Alouette".



Left to right, Lawrence Zeleny, Agricultural Marketing Service, Washington, D. C., James M. Doty, Doty Laboratories, Kansas City, Mo., and W. H. Carter, Shawnee Milling Co., Shawnee, Okla.

AACC VISITS CINCINNATI

Typical banquet scene with AACC members and wives participating in a fun packed evening of good food and entertainment.

Convention photo coverage by Clyde J. Steele, General Foods, Inc., Battle Creek.

THE CINCINNATI MEETING will be long remembered for the excellent arrangements and technical program provided. Approximately 500 members were registered accompanied by 100 wives, thus a total attendance of just over 600 persons.

The technical program consisting of some 50 papers was well augmented with three guest speakers talking on a broad range of subjects of vital interest to the cereal chemist. The Presidential Address given by Dr. William B. Bradley of the American Institute of Baking, Chicago, is printed elsewhere in this edition along with the talks by R. G. Ruark, Corn Products Refining Co. (p.119), John P. Snyder, Jr., Pillsbury Mills (p.110) and Leslie F. Sheffield, Nebraska Wheat Commission (p.128).

The remainder of the technical papers will appear in one of the Association's two publications (CEREAL CHEMISTRY or CEREAL SCIENCE TODAY) sometime during the coming year. Those interested in more information may write regarding specific manuscripts.

William J. Simcox, Distillation Products Industries, receives morning carnation from Wallace & Tiernan flower girl.

Dr. and Mrs. Lawrence Zeleny admire President's Recognition Scroll just received from AACC members.

MIAG NORTHAMERICA • G. Norman Irvine, Grain Research Laboratory, Winnipeg and Hans J. Koch, MIAG Northamerica, Minneapolis.

BRABENDER CORPORATION • Left to right, Arthur Hartkopf, Brabender Corp., T. R. Warren, Farmers Co-operative Commission Co., Gerald C. Hooks, and Charles A. Becker, Sheffield Chemical Co.

CHAS. PFIZER & CO. • Left to right, Kenneth M. Armstrong and Alfred Barton, Ogilvie Flour Mills, Ltd., Charles Feldberg, Herb. G. Dreisbach, and Edward F. O'Neill, Pfizer, Rudy H. Ellinger, Pillsbury Mills, and Roy C. Hannum, Pfizer.

MERCK & CO. • Left to right, Clayton J. Schneider, Henry & Henry, Inc., Chas. G. Webster, Merck, Ann J. Collins, Best Foods Inc., Raymond G. Valerio, Clinton L. Brooke, and B. W. Carmichael, Merck, and Harvie Barnard, Roman Meal Co.

EASTMAN CHEMICAL PRODUCTS, INC. • Left to right, Robert L. High, Keever Starch Co., Winborn C. Cooke, Richard E. Sherwin, Ben N. Stuckey, Eastman Chemical Products, and Walter M. Miley, Kever Starch Co., discuss the merits of Tenox, an Eastman product.

D. B. Pratt, Jr., Pillsbury Mills, looks on as his neighbor L. L. McAninch, Sterwin, proves a point to a friend across the table.

"Queuing up" to purchase tickets for a "horse race" at the Tuesday night Briar Hop.

FRIES & FRIES, INC. • Left, Ralph B. Potts of Montana State College talks with Merrill J. Gross of Fries & Fries, Inc.

HARSHAW SCIENTIFIC CO. • Left to right, Carl Taglauer and R. Seaman, Harshaw, Roy Anderson, Northern Utilization Research and Development Division, USDA, George Fraenzele, Harshaw, and Charles Vojnovich, NURD, USDA.

STERWIN CHEMICALS, INC. • Left to right, A. H. Goodman, DCA Food Industries, Majel M. MacMasters, Northern Utilization Research and Development Division, USDA, William O. Edmonds and Robert S. Whiteside, Sterwin.

C. W. BRABENDER INSTRUMENTS, INC. • Ernst J. Pyler, Bakers Digest, chats with C. W. Brabender while Mrs. Brabender listens in. Lawrence Jents, DCA Food Intrustries, confers with August O. Schmitz of C. W. Brabender Instruments.

AACC wives registering at the Krohn Conservatory during a morning tour.

I. Hlynka, Grain Research Laboratory, Winnipeg, Kurt Hess, Germany, Betty Sullivan, Russell-Miller Milling Co., and C. W. Brabender, C. W. Brabender Instruments, Inc. Dr. Hess is the famous German protein chemist and was visiting our meeting as the guest of C. W. Brabender.

H. H. Wurtz and L. G. Crandell, Arkansas City Flour Mills, chat with Harry J. Alleman of Kroger Food Foundation.

Highlights of the meeting occurred on several occasions but none more gratifying than the election of Drs. C. H. Bailey and John C. Baker to Honorary Membership. Both of these gentlemen have been members of the AACC for a long period of time (from 1922) and have contributed much to the Association as well as to their chosen field of endeavor.

Bailey is retired dean of the University of Minnesota's Institute of Agriculture. He received the Thomas Burr Osborne Award from the AACC in 1932 and served as president during 1937-1938. He has been actively associated with the enrichment program and served as the first Director of Research for the General Mills Company.

John C. Baker recently retired from the Wallace & Tiernan Co. and was for many years associated with their work in flour maturing and bleaching. Recently he helped develop the Baker Do-Maker, a continuous bread-making machine manufactured by Wallace & Tiernan. In 1945 he was awarded the Osborne Medal by the AACC for outstanding work in cereal chemistry.

B. Marlo Dirks, J. Marshall Pollock, and John Holme of Procter & Gamble Co. share technical notes while reminiscing about college days at the University of Minnesota.

Official gavel turned over to Clinton L. Brooke, President, by retiring president William B. Bradley at the closing business session of the AACC's 43rd Annual Meeting.

THE FUTURE OF THE Corn Wet-Milling Industry

By Robert G. Ruark, Vice President, Corn Products Refining Co., New York*

IT SEEMS APPROPRIATE to talk just a little about the past and present; to say something about the roots of our industry, our processes, our products, our history. We of this industry are the largest single industrial users of marketed corn. In 1957 we consumed about 140 million bushels. This amount sounds impressive until we consider the size of the corn crop harvested in the fall of 1957; a crop of 3.4 billion bushels.

Our industry used nearly 4% of the total crop. The corn coming to market in 1957 was at least 10% of the 1957 crop. The remainder was fed on the farm going principally into the hog, a great competitor for, but an inefficient user of, our raw material. The hog converts 3.5 lbs. of corn equivalent into 1 lb. of weight. We do better because of the nature of our finished products and chemical gain. From 1 lb. of commercial corn we produce 1 lb. of finished saleable product.

We are a large-volume industry and consequently ship to the consumer at low prices. The average price of our bulk products in 1957 was about 7½¢ per pound. As illustration of our volume, we ground 7.4 billion pounds in 1957. In contrast, the soap and synthetic detergent industries in 1957 produced 4 billion pounds or 56% of our grind. The entire synthetic rubber industry produced 2.5 billion pounds or 35% of our grind.

Now a few moments to tell you what we do with corn. We grind corn to make starch. In 1957 we made about 4.2 billion pounds of starch. In doing this we produce corn oil, corn gluten meal, corn gluten feed and steepwater as by-products. We sell starch as such and in modified forms to suit the needs of our customers. These modifications are effected by oxidation, acid hydrolysis, chemical addition or thermal treatment.

Significant amounts of the starch we make are used in our own plants to produce corn syrup and dextrose or corn sugar. In 1957 about one-half of the starch we produced was used to make these products.

Just a word or so about our history. Our industry is an old industry. It is Known that Cato the Elder expressed interest in the separation and purification of starch from cereal grains about 170 B.C. Through the 18th century the separation of starch was practiced on the continent in crude plants processing wheat, barley and potatoes. The first practical processing of our native American corn was in 1842 by an English immigrant, Thomas Kingsford at Oswego, N. Y.

Following the Civil War, wet milling plants sprang into being from the Atlantic seaboard to Nebraska. Processing starch and corn syrup were secondary to financial manipulation enhanced by unethical merchandising practices. Technical and manufacturing inefficiency coupled with economic mismanagement shattered the foundations of an industry only half a century old. Its products were not trusted by its customers and the financial community carried no respect for its businesses.

At the turn of the century, when chaos was the byword of the wet milling industry, some strong and competent men entered the picture. Among them was Edward Thomas Bedford, the founder of our company. Bedford, his colleagues and his competitors introduced ethical practices and rebuilt our industry on a strong base. During the last 50 years our companies have completely regained the respect of the invêstor, operating on a sound financial plane. The fact that wet milling stocks have held their levels or increased in value during the recent recession certainly proves public confidence. Our products are valued by the industrial and home users for their high quality, their economy and their uniformity. Our plants are modern, safe and are operated in the hygienic fashion necessary for food production. The conscientious effort of thousands of persons has made an industry from the shambles which existed in the early 1900's: an industry devoted to service and products for the home and for the manufacturer.

Now let's consider some of the technology and the major scientific advances of our past. Whatever methods Kingsford used, they were certainly primitive compared to our operations today. The only chemist in the plants was the man who judged the end of a corn syrup conversion and this was carried on in a secret alchemical fashion. Slab corn sugar was made in the latter part of the 19th century by methods now out-

*Presented at the 43rd annual meeting, Cincinnati, Ohio, April 8, 1958.

moded. Plant waste streams were large and were dumped into the adjacent river, decomposing and polluting the water supply. Plants involved huge amounts of physical labor including the shoveling and handling of wet starch cake. This activity can be described as requiring ten times the effort needed for shoveling wet snow.

American ingenuity, American technology, American vigor changed these conditions and brought forth new methods and new products. Some of the important factors changing an ancient art to a modern industry involved:

1) The institution of hydraulic handling and starch table flushing, eliminating starch shoveling.
2) The proper utilization of water in the plants and the bottling-up of plant waste streams.
3) The elimination of kilns and installation of modern belt, rotary and flash driers.
4) The creation of modern syrup and sugar manufacturing processes including continuous conversion and refining systems.
5) The replacement of starch tables with enclosed centrifugal starch-gluten separation and concentration systems.
6) The substitution of high velocity liquid cyclones to replace slurry tanks and filters in washing operations.
7) The recent fundamental change in the wet milling process where attrition mills are replaced by units involving an impact principle.

While these factors influenced manufacturing, the companies in the industry became more conscious of the value of the chemist and the chemical engineer. There were major scientific advances in these years. Many participated, many invented. It is impossible to give credit to all so no names will be mentioned. Some responsible for these discoveries are here with us; others are cereal chemists departed. As examples of important advances:

1) The chemistry and process conditions now used in the manufacture of dextrose.
2) The application of zymology to the manufacture of corn syrups.
3) The elucidation of the structure of corn starch revealing it to be principally two macromolecules, amylose and amylopectin.
4) The result of the efforts of the geneticists in the breeding of hybrid corn and waxy maize.
5) The determination of molecular size of starches and starch fragments.
6) The advances in measurements of carbohydrate products involving such new techniques as electrophoresis, chromatography and nuclear magnetic resonance. There are undoubtedly many others.

Thus far this discussion has involved only the past and the present. To harvest a corn crop one must prepare the land, sow the seed, cultivate the plant, pray and wait. The saying, "Knee high by the fourth of July" is highly appropriate. If the plant gets to this point then the farmer can wishfully predict the yield. Perhaps we have reached the fourth of July in terms of this talk. In predicting it is difficult to separate the various phases an industry will go through in the future. This discussion of the future will involve three areas with minimum repetition; Crop and Crop Economy, Technology and Products and Corporate Future.

Just a few guideposts. The gross national product in 1957 was valued at 434 billions of dollars; in 1975 the estimate is 835 billions of dollars or nearly doubled. Our population in 1975 will total 237 million or 64 million more persons than today. The average person will have $2,500 after taxes to spend using a 1957 dollar value and this is in contrast to a present figure of $1,760 per year. An industry such as ours serving the basic manufacturer and with a strong emphasis on food products can only be optimistic.

The corn crop of the future must be larger than the crop of today. Today's much publicized surplus of corn is only about 1,200,000,000 bushels, four months' normal supply. This is not an extravagant amount since one poor crop could wipe it out entirely. No doubt the corn yield per acre will increase significantly by 1975. It must! Decrease in planted acreage and a continuing decrease in farm population can be offset in only one way: more bushels per acre.

There are certainly strong economic implications here. With the population increase predicted, the demand for all foodstuffs will increase radically. The competition between the animal and the industrial user of corn will combine to increase cost per bushel. It can be said that improved genetics, improved farm practices and increased fertilization will solve the problem and they will. Each of these requires effort and effort requires monetary expenditure. The only conclusion that can be drawn is more dollars per bushel of grain in the 1975 industrial market.

There will be technological change in the crop. Geneticists today are working for higher protein and higher oil in the kernel to provide more calories per gram and better nutrition for animals. Their efforts will be evident in 1975 and will affect the wet miller since there will be less starch per bushel. The protein products from the wet milling process provide excellent nutrition for the animal so the starch loss will be offset by the feed gain. High oil content is a boon to our industry. Our nation is gaining more free hours per week (incidentally, the work week in 1975 is estimated at 34 hours) and is changing its eating habits. The salad and the salad dressing are increasing in popularity. The recognition of the value of corn oil in nutrition and its possible use in preventing coronary disease, along with the personal interest of many in staying thin, will necessitate increased quantities of corn oil in the future.

There are other genetic changes expected in the corn crop of the future. Waxy maize, producing amylopectin, is an established crop going principally to industrial users. The crop will increase in the future and will be processed by more companies. Even more important in the future will be high amylose corn. Today the geneticist is on the verge of a new breakthrough, stimulated by the wet-millers. High amylose corn can provide a product for the future to economically replace cellulose. It can provide products which can never be made from today's corn starch or from cellulose. Through the corn wet miller, and only through the corn wet miller, new products will be born when the genetic problems of this crop have been solved.

On the subject of technology and products we cannot dwell on the multitude of consumer convenience products that may be produced in the future but rather on changes in the basic products to be made and the processes involved.

In processing, we have left the starch table and gone to the centrifugal; we have left the kiln for the

modern types of dryer; we have walked away from the slurry tank and filter to use the liquid cyclone. It still takes about 40 hours of steeping to break the starch-gluten bond and these hours constitute millions of dollars in capital investment. Steeping time can be reduced or eliminated. The possibilities of ultrasonic breakdown and electrical or magnetic separation remain to be studied. In the past ten years we have studied grinding and have learned our basic attrition principles were wrong. Now we are beginning to take advantage of the impact milling principles. Further advances will be made in mechanical principles of corn milling and starch-gluten separation.

In the field of starch chemistry much progress has been made in the last ten years. Most pertinent are the hydroxyethylated starches and the starches cross-bonded by phosphorylation. These products provide in one instance an improved starch film; in the other an improved starch gel.

Much has been said about the effect of synthetic products on the starch industry. There are those who view vinyl acetate as serious competition for starch and who look at every pound of vinyl acetate sold as a pound of starch not sold. A better view involves the sale of additional starch each time a pound of vinyl acetate moves into industry because it supplements our material. It provides adhesives and coatings we could not make with our products alone, and our products supply the economy needed by the user. The result is a poker game where everyone wins a dollar. The combination of a starch product and a petrochemical product results in consumer goods which could not exist unless both entities were present.

Today we have starches replacing gelatin and casein in many uses; we have starches supplementing or replacing synthetic resins in many uses. Modern starch derivatives are increasingly more compatible with natural polymers and newly developed synthetic polymers. No starch film or fiber today can compete in a physical sense with cellulosic films or fibers or with the more recent films or fibers from polymerization of simple molecules, but we are fortunate in having a natural polymer as a starting material. We need only time and ingenuity to learn how to use this natural gift to provide products more than competitive for the future.

Next the future of corn sweeteners. In recent years the character of glucose or corn syrup has changed radically. This has been the result of the application of enzymatic conversion. The demand for syrups of definite viscosity, increased fermentability and increased sweetness has had a definite effect on the products we offer in the syrup line. Twenty years ago a prophecy that the syrup entities were all known could have been reasonable. Since then enzymatic techniques have changed the entire picture. We have learned to regulate many physical and chemical variables in the manufacture of syrups from starch. In the future the exact properties demanded by the customer will be produced by techniques not known at present. About one year ago, an enzyme system capable of converting dextrose to levulose was announced. The syrup manufacturer has worked for years on the conversion of dextrose to levulose, to provide products having increased sweetness, but no economic process has resulted. The mentioned discovery will be developed further to provide high-levulose-bearing syrups.

Enzymatic conversion of starch is now practiced by users as a thinning method. Special starches have been provided by our industry to make this conversion easier. Further advances in the character of these starches is to be expected and enzymes having a more selective nature will be forthcoming. The literature is abundant with references to enzymes capable of splitting starch into large uniform fragments with essentially no small fragments. Likewise many references pertain to enzymes capable of breaking starch down to its monomeric component, dextrose, with no large amounts of polymers remaining. This type of conversion has been studied in many laboratories and ultimately can revise syrup and dextrose manufacturing processes.

Our industry is naturally adapted to enzyme processes and the use of these processes has only been touched lightly. The whole field of uses for protein-splitting enzymes is in its infancy. The future will bring many further applications of zymology to practical adaptation.

The future of our by-products merits more than casual mention. In the early years our proteins were dumped in a convenient stream; later for economic and hygienic reasons they went to the feed market at whatever price the user would pay. With the advent of the broiler factory the value of corn gluten meal in chicken feeding was recognized and since this discovery our industry has sold it on merit rather than availability. More recently the value of steepwater in bird nutrition has been determined. For years this product has been dried on corn fiber to produce corn gluten feed, an item fed principally to cattle. Now we know its proper place is in diets designed for poultry. The practices of our industry and of the feed manufacturing industry will change as a result of this discovery. Within the past year the value of corn glutelin, a co-product derived in manufacturing zein, has become evident. High content of methionine and generally improved amino acid balance make this material particularly valuable to the chicken raiser.

Going back to steepwater, we all know of its value as a nutrient in the growth of penicillin and other antibiotics. This use and the growing use of this product in industrial fermentation have raised its status from by-product class to product class. Further laboratory work is even more intriguing and industrial uses completely unrelated to feeding or fermentation will be evident in the near future. In predicting the future the obvious conclusion is that selective fractionation of by-product streams will produce products of value to many segments of our national economy and will provide substantially increased monetary return to our industry.

One other material classed as a by-product remains. Corn oil has sold in the past as a valuable human food based on its flavor, its palatability and its nutritive quality. Little consideration has been given and no claims have been made concerning its possible value in preventive or corrective nutrition. Medical investigators, biochemists and chemists in their study of coronary diseases became suspicious of dietary fat as a source of cholesterol. First cholesterol itself was blamed; then fat in general; then the study narrowed to types of fat and to minor constituents of fat. In the past few years evidence has accumulated concerning the value of unsaturated oils in the diet. Today we can say, without equivocation, the inclusion of unsaturated oils in the diet results in a decrease in the blood

serum cholesterol content. We can say further diets high in saturated fats or deficient in unsaturated fat produce high blood serum cholesterol content. Further, corn oil is far more effective in this respect than would be predicted from its degree of unsaturation.

Many persons feel the relationship of unsaturated fats to coronary disorders will not be determined for years. Meanwhile the evidence accumulates. It is reasonable to believe in five years or less the inclusion of specific amounts of unsaturated oils, particularly of corn oil, will be mandatory in the human diet in health. Further it is conservative to say the therapeutic value of corn oil in control of coronary disorders will be definitely established.

Now something on the nature of our corporations in the future. The early wet miller made starch and corn syrup. Later, companies using his products or working in allied fields added wet milling to supplement other lines. Recently consolidation of wet millers with others having wide marketing ability has taken place. At the same time diversification into lines fitting our methods of manufacture or adaptable to our selling mechanisms has increased our corporate efforts. As examples: One wet miller in the adhesives field has become a major manufacturer and seller of resins. One large wet miller is affiliated with a major manufacturer and seller of a complete line of food products. Still another has emphasized the sweetener line by acquisition of a sucrose and invert syrup company. At least two have merged with companies manufacturing complete farm feed lines. These same two have emphasized the manufacture and marketing of retail textile softeners — new products for the home containing no corn-derived materials. One has chosen to mill grain sorghum rather than corn, thus providing further outlet for this important crop.

The prediction is obvious. The wet miller today is a sound member of the American economy. He will supplement his line by creation of new products. He will diversify by acquisition whenever the acquired unit fits either his manufacturing systems or his selling operation. He will extend vertically to provide raw materials or to carry his products to the ultimate consumer. His is a large-volume, low-selling-price industry. This large volume provides economy but requires high capital investment. A wet milling plant designed to produce a reasonable line of products will cost in excess of a million dollars per thousand daily bushels of grind. The minimum, new, economic plant must grind about 25,000 bushels per day so it is not likely we will hear of new small competitors in the future. It is certain our industry's growth curve will exceed the population growth curve and the gross national profit curve.

Rudyard Kipling paraphrased a quotation from the New Testament in his poem "Prophets at Home." He said "Prophets have honour all over the Earth, Except in the village where they were born." Webster defines a prophet as one who predicts future events, a seer. A seer is defined as a soothsayer, or fortune teller; one who professes to tell future events; often a charlatan. In conclusion, a charlatan is one who prates much in public, making unwarrantable pretensions. Now you know the nature of the person to whom you have been listening.

Milling Future

(Continued from page 113)

ing the basic parts of our industry, showing where we stand at the present time and what some of the apparent trends are. I spoke of technological deficiencies that exist in the wheat milling industry.

As I see it, there are three possibilities for the future:

1. We can try to initiate activities that will halt the downward trend in per-capita consumption and possibly start it on the upturn, which would ensure an excellent future for the wheat-milling industry.

2. We can hold per-capita consumption where it is now and depend on population increases to make a slowly expanding industry.

3. We can create new products, new interest, and new markets which would result in a much more vigorous and expanding industry. I don't think anyone in business today wants to be satisfied with an industry that is just maintaining its status quo. The objectives for the future, therefore, seem obvious — education and promotion for increased per-capita consumption, and chemical and other technological discoveries, resulting in expanded markets and broader uses for the industry's products. These objectives depend on new knowledge, new products, and new markets, both nutritional and industrial. I think the scientists and other technical people in the wheat milling industry have been guilty of too much "tunnel vision," looking and directing their efforts almost exclusively at baking and baking performances. In the age of molecular science, nuclear power, radiation, sensational drugs, plastics, and synthetics, we must broaden our vision to scan new horizons and find out more completely what is in the wheat kernel and what it can be used for. The answer to the future growth of the industry appears to be in research and in the field of cereal chemistry.

Thank you for your attention.

NEW AACC MEMBERS

Anderson, Roy, Peoria Heights, Ill.
Anzulovic, Bertha Mann, College Park, Md.
Bennett, J. F., Montreal, Canada.
Bequette, Robert K., Bozeman, Mont.
Bobrowski, S. A., Jr., Old Bridge, N. J.
Bookwalter, George N., Enid, Okla.
Buckheit, John T., New York, N. Y.
Carmichael, B., Wayne, Minneapolis.
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Craig, Mary Cecil, St. Louis, Mo.
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Dubois, David V., Rochester, N. Y.
Eide, Ralph W., Chicago.
Ferrari, Emilio P., Rutherford, N. J.
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Hofmann, Emil, Monterrey, Mexico.
Holme, John, Cincinnati
Holmes, Warren H., Arlington Heights, Ill.
Hoover, Helen L., St. Louis, Mo.
Japiske, C. H., Cincinnati.
Kagan, John J., Toronto, Ontario.
Kaufmann, Henry H., Minneapolis.
Kuhlmann, W., Duisberg, West Germany
Light, Ronald A. J., Buffalo, N. Y.
Locken, Lawrence, St. Louis Park, Minn.
Lynch, Barry T., Rhodes, N.S.W., Australia.
Mailhot, William C., Los Angeles, Calif.
Margroff, Dale H., Sacramento, Calif.
McDonald, Clarence E., Albany, Calif.
Miller, Paul G., Hoboken, N. J.
Mills, Charles R., Park Ridge, Ill.
Porter, Frederic E., Columbus, Ohio.
Pratz, Bernard, Paris, France.
Rapp, Harold, Whitestone, N. Y.
Rich, Harold M., Chicago.
Schierbeck, John, Los Angeles, Calif.
Serafinski, Marion R., Chicago.
Silverman, R. O. P., Jr., Whitestone, N. Y.
Smit, J. A. P., Jr., Wageningen, Holland.
Smith, Richard N., E. Norwalk, Conn.
Stern, Bernard, Chicago, Ill
Wagner, Joseph R., Summit, N. J.
Wilbur, Dean E., Toledo, Ohio.

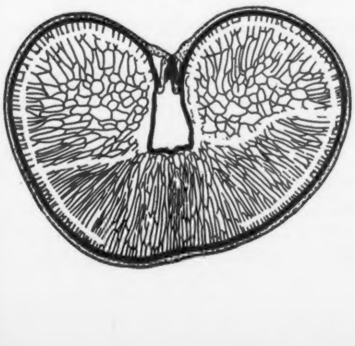
BAKING PROPERTIES OF Air-Classified Flour Fractions

By Frank W. Wichser, Technical Director, Hard Wheat Section, Headquarters Quality Control, Pillsbury Mills, Inc., Minneapolis, Minnesota

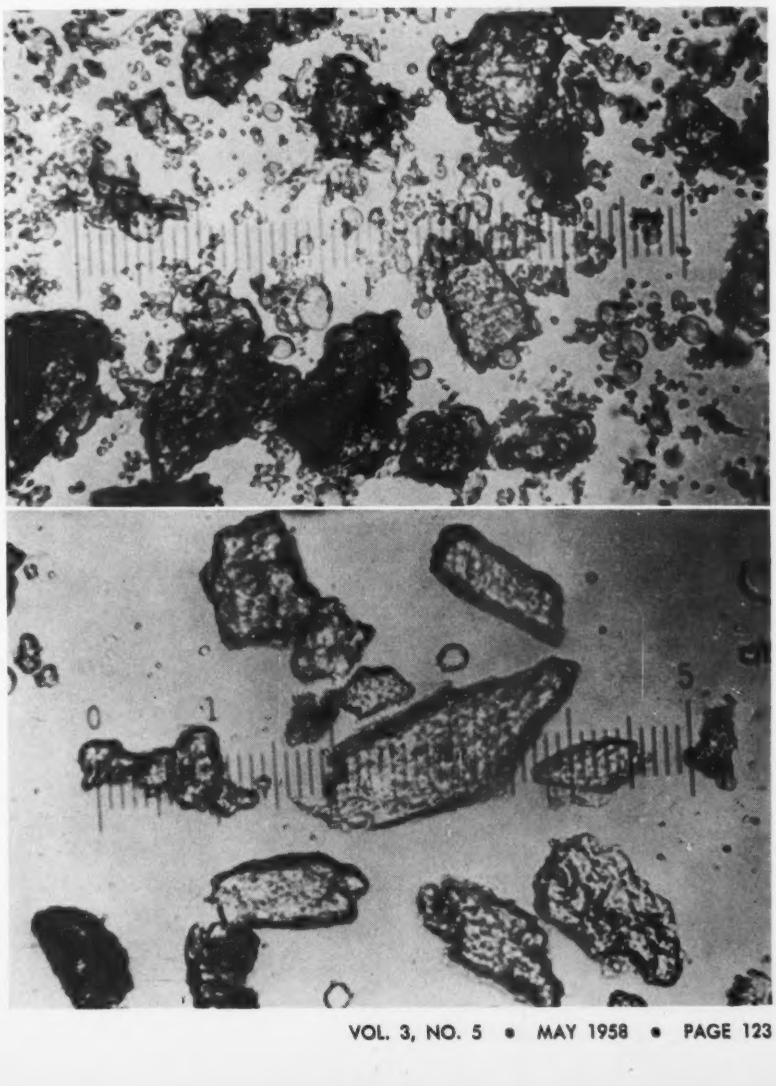
For many years it was believed that the inner kernel or endosperm of wheat was completely uniform and homogeneous in its makeup; that is, that all portions of the inner kernel contained exactly the same ash and protein content, and that all portions had exactly the same baking properties. In recent years, however, this belief was questioned by several research groups (2, 4) who subsequently revealed that the very center portion of the wheat kernel contains a flour having the lowest ash and protein content. As endosperm portions radiate like circular layers out toward the bran coat, the flours therein increase in their ash and protein content. Also revealed was the fact that these flour portions, depending upon their location inside the wheat kernel, have different inherent chemical, physical, and baking properties (3, 5).

More recently, another research group (1) discovered that there is a direct relationship between the "zones" of the wheat kernel and of naturally existing, different-sized flour cells or particles in these zones. This is shown in the cross-section diagram of a wheat kernel. The largest flour cells or particles are generally located in the innermost zone of the kernel cheek, and there is a gradual reduction in size of flour cells or particles as zones radiate from the center of the cheek out toward the bran coat. Thus, we now know that flour is not a powder, milled from a homogeneous substrate. Within one flour milled from the same wheat, one can distinguish all sizes of endosperm flour cells with the aid of a microscope, as well as cell-wall material, free starch granules, particles of free protein, and starch particles with pro-

Cross-section of wheat kernel.



Photomicrographs of wheat flour; above, before being subjected to an air-classification process; below, free starch and protein matter removed by air-classification.



tein adhering thereto. That flour cells or particles vary in size to such an extent is not entirely due to the milling process, since these different-sized particles are generally formed in the growing stages of all classes of wheat kernels.

Individual single flour cells or particles in winter and spring hard wheats are not easily broken open, and thus are not reduced to their component materials of free starch and protein. In soft wheat, however, the flour cells break open more easily upon impact of the rolls, and the starch granules and protein material inside the flour cells spill out.

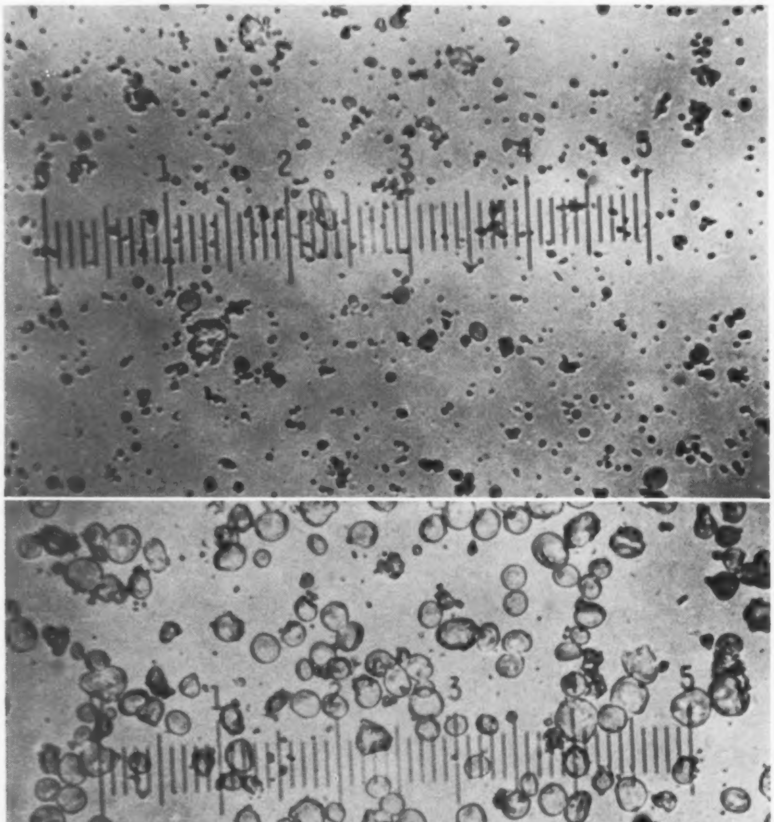
It should be pointed out for the sake of clarity that an all-inclusive flour particle size range for any flour is nearly the same, regardless of the class of wheat from which it was milled. The percentage of fines flour material and of the coarser flour particles, however, is greatly different, and is directly related to the class and to the vitreousness of the wheat.

For simplicity throughout this paper, references will be made only to flour fractionated portions as being "fines high-protein material," or "fines low-protein starchy material," or a fraction of "various sizes of endosperm chunk particles nearly void of the first two materials."

In a soft wheat flour, approximately 20% of a fines high-protein fraction naturally exists, compared to only 15% of a similar material in a winter hard wheat flour. This does not mean, however, that a larger quantity of the fines high-protein material naturally exists in soft wheat flour over hard wheat flour. It means that more of the individual soft wheat flour cells have been broken open because of the impact action of the rolls, thus allowing free starch and protein material to escape from the flour cells. Soft wheat flour also contains approximately 60% of a fraction made up largely of free starch granules, but low in protein content. This compares to approximately 25% of a similar material found in winter hard wheat flours. Nature changes the kernel vitreousness factor each crop year; therefore the percent of fines and coarse material produced in all classes and grades of flour varies each crop year. This is one of the prime reasons why the baker experiences differences in baking performance of flour from one crop year to the next.

Flour produced by the conventional milling system, using conventional flour sifters, is composed of particles covering a wide particle size range. All flour particles, however, are still small enough to pass easily through the smallest or closest-woven bolting cloth used in the flour mill.

Photomicrographs of wheat flour after air-classification; above, fines high-protein fraction; below, the fraction best suited for high-sugar cakemaking.

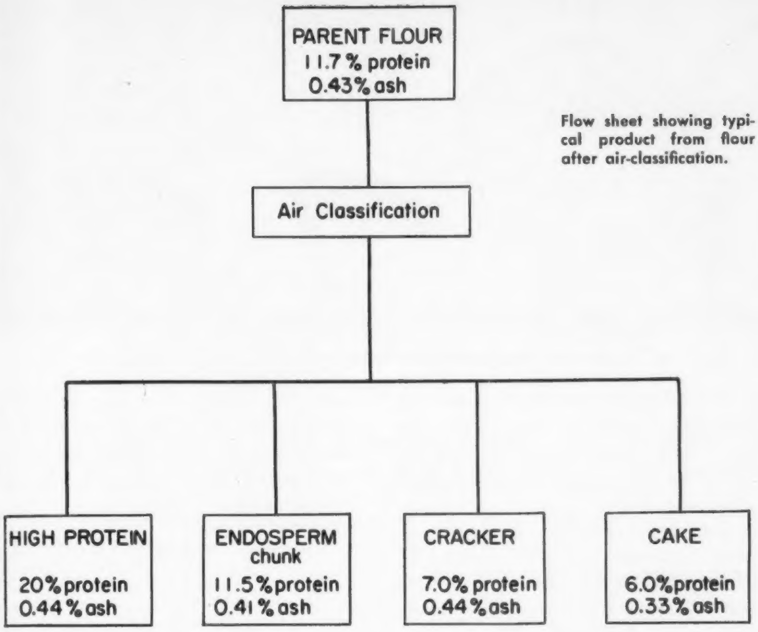


Air-Classification Process

In recent years a new air-classification process has been developed. With this new process any given flour can be fractionated into its component parts and subsequently reassembled into many totally new flours. For example, in the conventional milling of a good all-winter-Kansas bread flour, approximately 25% of the flour contains a low-protein starch material which makes fine cakes but is not suited for breadmaking. The removal of this 25% material remarkably upgrades the remaining 75% for making bread. Similarly, by removing the high-protein very fine material and also the oversized chunk endosperm material from a soft wheat cake flour, the resultant cake flour portion is much upgraded for cakemaking.

The flour air-classifying process has sometimes been referred to as "protein-shifting" or "turbo-air separation." The principle of flour air separation is based on several laws of physics.

The series of four photomicrographs, taken in order, show: first pair, above, a conventionally milled hard winter wheat "parent" flour before being subjected to an air-classification process—the flour that is ordinarily received by the commercial baker for breadmaking. All sizes of



Flow sheet showing typical product from flour after air-classification.

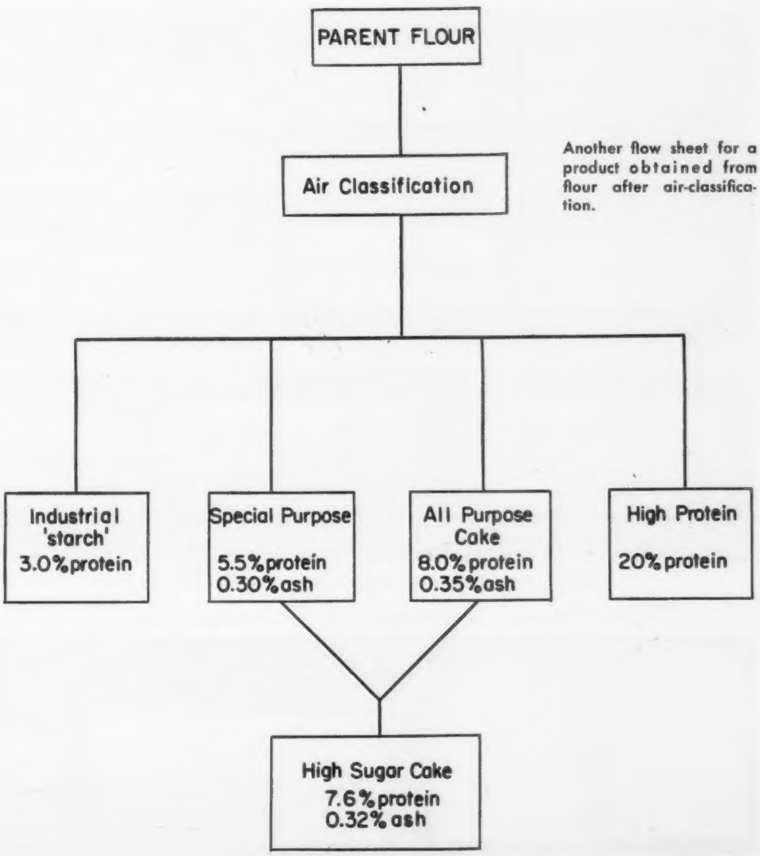
chunk endosperm particles are observed, as well as free starch granules, and some small protein fragments having an irregular shape. Below, the fraction containing various sizes of chunk endosperm particles and with substantially all of the free starch and protein matter removed by air classification. The second pair of photomicrographs shows, above, the fines high-protein fraction, substantially free of endosperm chunk particles and of the larger-sized free starch granules. This fraction is commonly used by the commercial baker as a carrying flour for strengthening purposes. Below, the fraction which is best suited for high-sugar cakemaking. It consists mostly of free starch granules along with a small amount of adhering protein.

The two flow sheets show typical products that can be obtained from conventionally milled parent hard winter and soft winter wheat flours after air classification. It may come as a surprise to some to learn that from a hard red winter wheat bread flour a low-protein fraction can be separated having a baking performance in high-sugar cakes that is very similar to that of an excellent conventionally milled soft wheat cake flour! Similarly, from a conventionally milled soft wheat flour it is possible to produce fractions which have a wide range of protein content as well as of baking performance. For example, a product containing 20 to 25% protein may be separated from soft wheat flour. At the other end of the range is a product containing less than 3% protein. Intermediate fractions having desired protein levels or particle size ranges can also be produced.

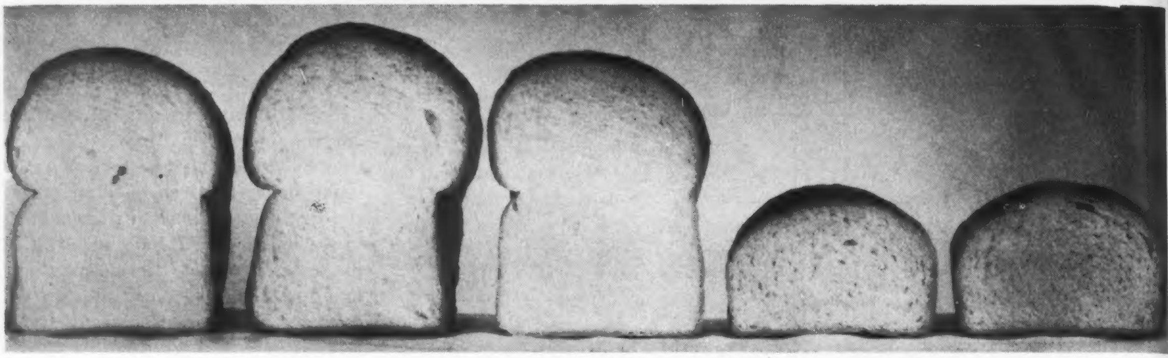
Baking Results

Some baking results of various fractions removed from a conventionally milled hard winter wheat bread flour are given in the next five illustrations. The first of these shows bread made with fractions shown in the preceding photomicrographs. The loaf on the left was made with the conventionally milled parent bread flour; the second with the fines high-protein fraction; and the third with the fraction containing various sizes of chunk-endosperm particles. The loaf on the extreme right was made with the fines low-protein starchy fraction. This fraction constituted approximately 25% of the parent bread flour.

Angel and layer cakes are shown in a composite group of three sets. The same fractions in the same sequential order were used in making high-sugar angel cakes (top). The parent flour, the high-protein, and the endosperm-chunk fractions make poor cakes (three at left), whereas the fines low-protein starchy fractions



Another flow sheet for a product obtained from flour after air-classification.



Bread made with flour fractions shown in the preceding photomicrographs.

(extreme right) make excellent cakes. The center set shows, in the same order, fractions used to make layer cakes. Again, the fines low-protein starchy fraction makes the best cake (right). It should also be pointed out that the fines high-protein fraction (20% protein) makes a better cake than does the lower-protein (11.5% protein) chunk-endosperm fraction. This shows the influence, and importance, of flour particle size in cake flours. In the set of four cakes (bottom), the left-hand angel and layer cakes respectively are made with the fines low-protein fraction from the parent winter wheat bread flour; the right-hand cake of each pair was made with a cake flour of known excellent quality, conventionally milled from soft wheat.

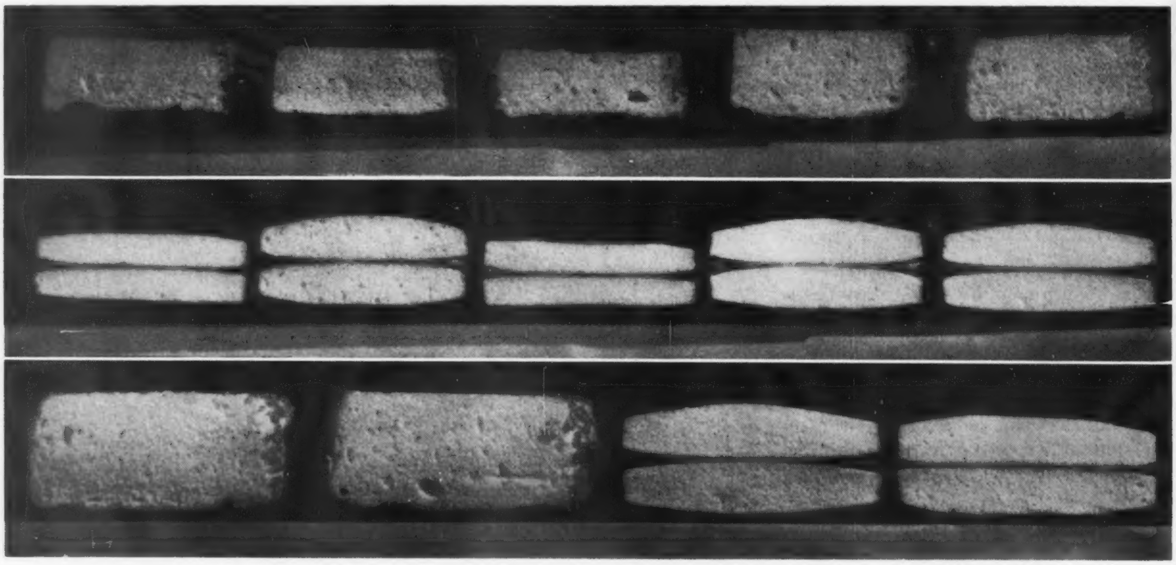
The final photograph shows the same fractions removed from the parent hard wheat bread flour—each fraction, however, being baked into the product for which it is best suited.

Summary

With the use of this new air-classification process the adverse influences of climate, soil, and constantly changing varieties will be substantially minimized. Moreover, the baker will be provided with a new family of flours tailored to his particular needs, with a uniformity upon which he can rely.

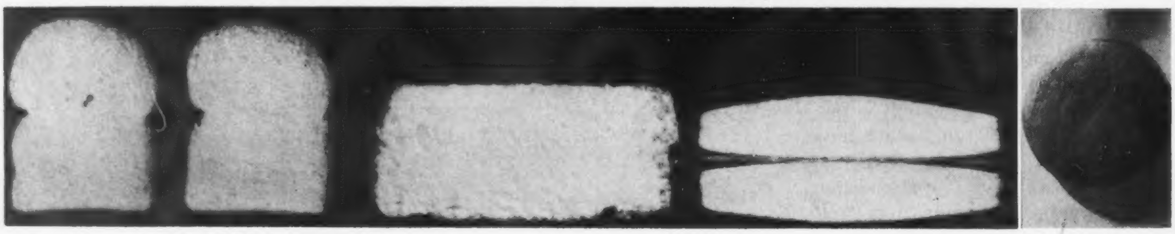
Literature Cited

1. Bradbury, Dorothy, MacMasters, Majel M., and Cull, Irene M. *Cereal Chem. 33:* 361 (1956).
2. Morris, V. H., Alexander, T. L., and Pascoe, E. D. *Cereal Chem. 22:* 351 (1946).
3. Shellenberger, J. A., Wichser, F. W., and Lakamp, R. C. *Cereal Chem. 27:* 106 (1950).
4. Wichser, F. W., and Pence, R. O. *Cereal Chem. 24:* 381 (1947).
5. Wichser, F. W., and Shellenberger, J. A. *Milling Production 13* (7) : 1-7, 27–29 (1948).



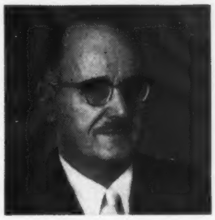
Angel and layer cakes made with the same flour fractions and in the same sequence as in the photomicrographs.

Results when the fractions shown in the photomicrographs were baked into the product to which each is best suited.



The Latent Research Potential of Physical Testing

By C. W. Brabender Instruments Inc.
South Hackensack, N. J.



C. W. Brabender

NINETY OUT OF 100 laboratories using C. W. Brabender designed physical testing instruments, such as the FARINOGRAPH, EXTENSIGRAPH and AMYLOGRAPH, apply them only to the task for which they were originally designed, namely, flour quality control. Yet these laboratories have only scratched the surface of the potential of these instruments.

Here and there scientific literature divulges where a laboratory has probed deeper with these instruments and used them to guide research into uncharted areas. The reports of such instances, however, are none too frequent because the industrial scientist is not always permitted the privilege of publication.

Actually, physical testing has been a significant factor in research behind such important new areas as prepared mixes and new ingredients that have contributed much toward the betterment of baking. Physical testing equipment has had a part, both here and in Europe, in the research that has led to the milling industry's most revolutionary development of this century, namely, fine grinding and air classification. C. W. Brabender designed physical testing equipment has been a partner in this progress.

Many research applications of physical testing instruments over the years have been possible because of modifications designed by the research scientist and built by us at his request. Out of such research have been born such instruments as our high shear mixer, for which every day applications exist. Many more such supplementary research tools await an awakening need for their use in production and quality control.

If any of the scientists in the field of cereal chemistry arrive at a point in their research where chemical analysis does not provide the complete answer and where performance tests show the result but don't divulge "why", we here at C. W. Brabender Instruments Inc., will be happy to help determine wherein physical testing might help provide the answer. If, therefore, any of you either want to send samples or drop in and see us, we will try to make constructive suggestions on how to apply our physical testing equipment. We are only 30 minutes from Times Square and always ready to be a partner in research progress.

A NEW APPROACH TO HELP SOLVE WHEAT PROBLEMS

Wheat Commissions

By Leslie F. Sheffield, Chief Nebraska Wheat Commission, Lincoln

JUST A LITTLE over one week ago, I was contacted by your President, Dr. Bradley, who asked me to give a report at your convention on the program of the Nebraska Wheat Commission and to explain something of the functions and objectives of the four wheat commissions now in existence.

Dr. Bradley explained to me that Mr. J. L. Welsh of Omaha, who served as Chairman of the President's Bipartisan Commission on Increased Industrial Use of Agricultural Products, had been scheduled to give a report on their recommendations at this time. I am indeed sorry that Mr. Welsh was unable to be with you today, since I am sure that his report would have been very interesting and timely because of the current interest in industrial utilization of agricultural surpluses.

Although the Nebraska Wheat Commission has considerable interest in the field of industrial use of agricultural surpluses, I am not adequately informed on the many ramifications involved to report on that subject. Consequently, I will stick to the subject suggested by Dr. Bradley — that of state wheat commissions, their objectives and activities.

Although a few people may picture cereal chemists as a group of long-haired scientists, I can assure you that I do not fall into this category. Although my college training at the University of Nebraska was in the field of agronomy instead of cereal chemistry, the Nebraska Section of the American Association of Cereal Chemists have either lowered their qualifications or else they need all the \$2-a-year memberships they can get; because I have been a member of the Nebraska Section for the past six years. As a result, I have had the pleasure of close contact with many of your fellow-members including men like Professor Sandstedt, Paul Mattern, Howard Becker, Ed Rosse, Jim Doty, Dr. Shellenberger, Dr. John Johnson, and many others including your President, Dr. Bradley.

Now, to get to the subject at hand.

First of all, I would like to set up some hypothetical questions which you might logically ask about wheat commissions — and then I'll attempt to answer them.

Question No. 1: Which states presently have wheat commissions?

Oregon set the pattern in 1947 when a group of Oregon wheat farmers asked the Oregon Legislature to create a state wheat commission and to provide for a tax of ½ cent per per bushel to be paid by the grower. The Oregon Wheat Commission is now in its eleventh year of operation, and if you have any doubts about how effective their program has been, just talk to some of their wheat growers about what it has accomplished for them. Last year Robert B. Taylor, Administrator of the Oregon Wheat Commission, reported on their activities at your convention in San Francisco, and undoubtedly many of you heard his very fine report.

The second state to set up a wheat commission was Nebraska. The Nebraska Wheat Growers' Association and other interested groups and individuals asked the Nebraska Legislature to provide for a state wheat commission in 1951. The law was passed by the Legislature in 1951 but was vetoed by the Lieutenant Governor while the Governor was out of the state. Not to be denied, the growers came back in 1955; the Nebraska Wheat Resources Act was passed by the Legislature, signed by Governor Victor Anderson, and became law September 18, 1955.

The Nebraska law provides for a wheat excise tax of ¼ cent per bushel, paid by the grower when wheat is sold. A board of seven wheat growers appointed by the Governor decide how the funds are to be used.

The third state to provide for a wheat commission was Kansas. Kansas wheat growers tried three times to get a law passed to provide for a wheat commission, and failed each time. However, wheat growers are a persistent group — especially when they are in trouble — so the Kansas Wheat Act was passed by the 1957 Kansas Legislature, signed by their Governor, and went into effect June 1, 1957. The Kansas Wheat Commission is financed by a levy of 1/5 cent per bushel, paid by the grower.

The fourth state to form a wheat

commission is Washington. In fact, I just this last week received word from their chairman that they have secured their wheat commission and are now in the process of getting it organized.

Other states are under way in their efforts to obtain wheat commissions, or have the matter under consideration. Colorado wheat producers east of the Rockies are voting this month on a referendum to establish a Colorado Wheat Commission. If two-thirds of the growers voting in the referendum vote in favor of the commission, then Colorado will become the fifth state to provide for a commission.

Wheat growers in North and South Dakota, Montana, Wyoming, Oklahoma, and Idaho have shown interest in the possible formation of wheat commissions in their states. It is apparent that the "wheat commission" idea is catching on with wheat growers who have been faced with serious problems in recent years.

Question No. 2: How are the commissions financed and organized?

In every case, the four state wheat commissions now in existence have been created by state legislation and are agencies of state government. However, in each case, the entire financial support of each commission is derived by an excise tax varying from 1/5 to 1/2 cent per bushel, which is paid by the grower. In no case do the state wheat commissions use any general tax funds; in fact, in Kansas 20% of the gross wheat tax receipts are turned over to the general tax fund. The funds derived are deposited in the state treasuries and are expended only on the basis of state vouchers or warrants in accordance with the provisions of the law which provided for each commission.

For the most part the laws and their provisions are quite similar; however, there are variations in each, and also some differences in the interpretation between states. However, all provide for a board of from five to seven wheat growers to decide how the funds collected are to be utilized. Ex-offico members of the board include directors of the State Department of Agriculture and the deans of the college of agriculture in each state. In Nebraska, a representative of the grain or milling industry (the president of the Nebraska Grain Improvement Association) is included as an ex-offico member of the board.

Question No. 3: What has brought about the interest in organizing on the part of wheat growers?

In the period of post-war years just after World War II, farmers in the U.S. enjoyed a tremendous demand for their farm products because many countries were short of food supplies. During this period of time, farm production shifted into high gear and supplies were beginning to build up in 1949-50 when the Korean conflict again opened the gates of world markets for U.S. agricultural products. U.S. harvested wheat acreage in the post-war years until 1954 was in the 70-75 million acre range, except for the years 1950-51 when acreage allotments were in effect. During this same time prices were good — wheat selling from $2.25 to almost $3.00 per bushel.

From 1946 through 1955, U.S. wheat growers produced an average of over 1.1 billion bushels of wheat from an average harvested acreage of 65 million acres. With the Korean conflict over and the widespread demand for food supplies put back, wheat supplies began to build up at a rapid rate. Acreage allotments and marketing quotas were established for wheat starting with the 1954 crop and have been in effect ever since. With these acreage allotments and marketing quotas in effect, wheat growers in the traditional wheat-producing regions found their acreage cut by one-third and, to make the problem more serious, the price has declined. In the summer-fallow wheat areas, where a crop of wheat is harvested on the same land only every other year, farmers do not have the wide choice of alternative crops as is the case in more humid areas, and these reductions have meant serious losses of income.

Despite the fact that since the 1954 crop, total U.S.-allotted wheat acreage has been at the 55 million level, total wheat production has still been near the one billion bushel mark. The 1957 U.S. wheat crop — with over 12 million acres in the Soilbank Acreage Reserve Program and only 43 million acres harvested — was almost 950 million bushels. How many bushels of wheat will be produced in 1958 with the most favorable winter moisture conditions in the history of the Great Plains? One estimate I saw last week indicated the winter wheat crop alone could be one billion bushels.

The individual farmer — faced by reduced acreage allotments and a declining price — has only one way to try to make up for this loss of income, and that is to incerase his yield per acre. That is exactly what has happened. Couple this with the provision whereby farmers without prior wheat history can produce 15 acres of wheat without penalty — no cross compliance between allotments — and we have seen a shift of wheat production from the normal areas of wheat production to eastern and southern states. Despite record exports in 1957, thanks to Public Law 480, wheat carryover supplies in July will be nearly 900 million bushels.

These are examples which illustrate why wheat growers in Oregon, Nebraska, Kansas, Washington, Colorado, and other states have become greatly concerned about their future and have decided to do something about it. Can you blame them? How many businesses in any line of endeavor, caught in a cost-price squeeze, could afford to have their production cut by one-third and at the same time have the price of their product reduced from 10 to 25 per cent.?

Small wonder that wheat growers in these states have decided it was high time they began to help themselves.

Question No. 4: Why have wheat growers chosen the state commission approach?

Wheat growers were not the first producer groups to try some means of self-help on the basis of some type of voluntary or mandatory levy on their product. Citrus growers, apple growers, pear growers, dairy producers, and many other groups have used this approach in some states and areas for years. Apparently this approach has proven satisfactory in most cases, because the idea with variations has spread from one commodity to another.

In many cases, the assessment or levy has been entirely on a voluntary basis; and generally speaking, the success of this approach depends upon how large an area and the number of producers involved. However, in the case of wheat, Oregon wheat growers set the pattern with a state commission provided by legislation and supported by a mandatory excise tax. This approach is the most

effective and the quickest, although it naturally involves some disadvantages when compared with voluntary programs such as the American Dairy Association.

Among the merits of the state commission approach are these: (1) every wheat grower in the state contributes to the program in accordance with his production; (2) only a small assessment is needed to raise substantial funds. For example, in about 2½ years' operation of our Nebraska Wheat Commission, our ¼ cent per bushel tax has yielded over $350,000 or more than a third of a million dollars; (3) expenditures of funds must comply with the law and are subject to state procedures, which provides some additional safeguards concerning the use of the funds.

Wheat growers in the various states have selected the state commission approach because this method offers the quickest and most effective way to secure finances and to get their program under way.

Question No. 5: In what areas have the state wheat commissions devoted their efforts and funds?

The answer to this question, of necessity, will vary from state to state. However, the general pattern of activities is quite similar in the states now organized.

In Oregon, Nebraska, and Kansas, the main areas of work fall into three categories: (1) development, such as research projects on new wheat varieties, production problems, etc.; (2) utilization, such as efforts to secure additional industrial outlets for wheat; and (3) marketing — efforts to maintain or increase markets for wheat, both domestic and foreign.

Development

Inasmuch as the state wheat commissions have all been organized since World War II, and during most of their existence wheat growers have been plagued with excess wheat supplies, development or production research has not received as much attention as activities in utilization and marketing.

However, in Nebraska, our Commission now has under way through contracts with the University of Nebraska College of Agriculture, four different production research projects which will run from 3 to 5 years at an annual cost of approximately $20,000. Some of these projects have overtones of marketing, since one deals with the inheritance of protein content of wheat and another is to study the inheritance of certain milling and baking characteristics. Professor Sandstedt and Paul Mattern are both involved in this latter study.

Utilization

Utilization of agricultural surpluses is a very popular subject these days and we have been hearing more and more emphasis placed on this topic.

However, it is one thing to talk about this subject and to pay it lip service — but quite another thing to make any significant advances in wider utilization of agricultural surpluses.

Before anyone should misunderstand me, let me make it clear that the Nebraska Wheat Commission is greatly interested in this field and that we are not completely pessimistic concerning utilization possibilities. Personally, I feel that President Eisenhower's appointment of a Bi-partisan Commission on Increased Industrial Use of Agricultural Products was a big step in the right direction. The committee, with the assistance of many highly qualified people, compiled a very comprehensive report and made some very sound recommendations. Their recommendations are largely embodied in legislation which will be under consideration by this session of Congress. The potential benefits from research on industrial utilization of agricultural products is tremendous and could have far-reaching beneficial effects to agriculture and the entire U.S. economy.

However, you as scientists working in the field of cereal chemistry undoubtedly are more aware than I that this approach and a sound program involving research on industrial uses of agricultural products must of necessity be a long-range one. It is not the "cure-all" for our present farm problem, as a few people and some of the news articles on this subject might have us believe. A program such as this will be years in the making, and we cannot hope for it to achieve miracles in one, two, three, or even ten years' time.

For this very reason, the wheat commissions, including our Nebraska Commission, have had difficulties in trying to get activities under way in this field. We have maintained close contact with Mr. Welsh and his commission, but this program is too large for an individual state wheat commission to undertake any major program. Perhaps later on we may be able to make some small contribution to industrial utilization projects for wheat, but so far our efforts in this field have been limited.

In Nebraska we have a small utilization project with the University of Nebraska which involves method of preparation and feeding of wheat to fattening beef cattle. Some of you may wonder what cattle feeder in his right mind would think of using wheat at $2.00 a bushel when he can buy corn at $1.00 to $1.25 a bushel. However, all of you are familiar with the Food and Drug Administration's "clean wheat program." With millions of bushels of wheat in storage, some of it will not meet Food and Drug requirements or is not of milling quality. For this reason, plus the fact that Congress has talked of the possibility of putting up to 100 million bushels of wheat in feed channels, the Nebraska Wheat Commission decided to sponsor this wheat-feeding project.

As a final comment on this subject, if you want to take on a first-class selling job, just try to get a qualified chemist or chemical engineer interested in finding industrial uses for wheat as opposed to cheaper grains such as corn, milo, oats, and barley — or worse yet, with petroleum or blackstrap molasses.

Marketing

By far the most effort has been placed in the field of marketing by the wheat commissions. The reason is obvious. Basically, our farm problem revolves around this concept: either U.S. agriculture is producing too much, or we need to find additional market outlets for our production.

Wheat growers realize only too well what has happened to them with a one-third cutback because of acreage allotments, and they are not anxious for any further reductions in allotments. To them, the only solution they find acceptable is to find additional market outlets.

Domestic Markets

Wheat growers well realize that their best and most stable market is right here at home. But food use of wheat in 1957 was only 480 million bushels, and all indications are that it will not increase in the near future. Per-capita consumption of wheat flour

has been dropping steadily for many years, and population growth has been the only reason for the steady level of total wheat food consumption.

Fortunately, the millers and bakers have long been aware of the problem of declining per-capita wheat flour consumption, and both groups have programs under way to help call attention to the merits of including wheat food products in daily diets. The Oregon Wheat Commission, under contract with the Oregon Wheat Growers' League, has employed a home economist to work in this field. In May 1957 the Nebraska Wheat Commission established a Nutrition Education Division with a home economist in charge of the program. Oregon's home economist is known as "Frances Fields," while in Nebraska we held a contest and selected the name "Amber Fields."

Mrs. Walton, our home economist, works with educational and professional groups such as home ec teachers in high schools, home extension agents, ladies' groups, dietitians, doctors, and dentists in calling attention to the role of wheat food products in daily menus. We obtain our educational materials from the Wheat Flour Institute and the American Institute of Baking.

With an estimated one-third of the U.S. adult population overweight, we need to point out that, contrary to what many people think, wheat food products are not fattening. Also we need to sell our product on the basis of economy — that enriched bread and cereals can provide up to one-fourth of a person's daily food requirements for only one-tenth of the total food cost.

The fallacy of undertaking such an educational program on a large scale on a state basis is that the problem exists throughout the United States and cannot be solved within the borders of states with wheat commissions. We need to unite our efforts as growers with those of the millers and the bakers to make the most effective use of our efforts and funds, since we all have common interests. Several joint meetings have already been held and efforts are underway now to set up a meeting of representatives from all states where the growers are organized with representatives from the milling and baking industries.

Although we cannot hope to bring about any significant increase in wheat food consumption in the near future, the decline in per-capita consumption will likely become more drastic if we do not undertake some joint efforts in this field.

Foreign Markets

As the world's largest exporter of farm products, the United States in the fiscal year 1957 supplied 22% of world agricultural exports. Exports of American farm products last year represented the output of 60 million acres, or about one out of every five acres of United States cropland. U.S. exports have increased from $2.8 billion in fiscal 1953 to $4.7 billion in fiscal 1957.

In the fiscal year ending June 30, 1957, the United States hit an all-time-high export volume in wheat and flour equivalent of 550 million bushels, valued at $958 million. This was equal to 55% of the nation's wheat production and constituted 44% of the world trade in wheat during that period. We can thank Public Law 480 which permits our government to accept foreign currencies from those countries which have signed agreements for a large share of these wheat exports.

The experts say that at the end of this century the world population will be about seven billion. Today it is almost three billion. This phenomenal growth will provide the 20th Century with one of its most challenging problems — food. The Food and Agriculture Organization of the United Nations says that today two-thirds of the world's people exist on less food than is considered the absolute minimum — and half of the rest barely get by.

Somehow, a way must be found to get better distribution of our surplus food supplies in the United States. How ironical it is that U.S. agriculture is facing a crisis because of its ability to produce too much, while two-thirds of the world's population does not have an adequate diet. Certainly the answer to this problem — if it can be found — would do more to bring peace to the world than any other single factor.

How do wheat commissions fit into foreign markets? Through a contracting arrangement with state wheat grower groups, the wheat commissions are contracting with the Foreign Agricultural Service, U.S. Department of Agriculture for foreign market development activities. Most of these activities are under Public Law 480, which provides that a small portion of foreign currency received for agricultural products is to be used to help develop additional foreign markets for U.S. agricultural products.

Under this arrangement, activities have been carried out in almost every corner of the globe by the existing wheat commissions. Most of the foreign marketing efforts of Oregon and Washington have been placed in Japan and in the Far East countries such as India, Korea, Pakistan, and Indo-China.

Nebraska and Kansas have concentrated most of their efforts in the past two years on countries in Europe and South America. However, now in preparation is a joint project between the Oregon, Washington, Nebraska, and Kansas commissions and the Millers' National Federation which involves India.

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Well, these are examples of wheat commission projects and activities. These activities represent what wheat growers in a few states are trying to do to help themselves. We don't expect to accomplish miracles, but we are working in areas which were beyond the scope of wheat growers before our state wheat commissions came into existence. For those of you who might be interested I brought a few copies of the 2nd Annual Report of the Nebraska Wheat Commission. If you want a copy, just ask me for one or write to me at Lincoln, Nebraska.

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People, Products, Patter

• • • People

Donald E. Alguire appointed food technologist, research staff, special products division, Borden Co.

James G. Baxter named associate director of research, Distillation Products Industries division, Eastman Kodak.

Ben F. Buchanan now associate director, product development, General Foods Research Center.

Paul J. Cardinal, Hoffmann-La Roche, elected v-p of National Vitamin Foundation.

B. Wayne Carmichael recently transferred to the Minneapolis office of Merck & Co. from the home office in Rahway, N. J. He will service the milling and baking industry, representing the general products division of Merck, which includes enrichment mixtures and wafers.

Fred O. Church named sales manager, southern region, Merck & Co.

David Coleman elected chairman, executive committee, Ward Baking Co. Other directors named to the executive committee are **Faris R. Russell, L. D. Haldimand, William C. Evans, Louis Yaeger,** and **R. Arnold Jackson. Leopold Cecil,** treasurer, Cecil Manufacturing Co., has been elected to the board of directors.

Robert H. Cotton appointed director of research, Continental Baking Co.

David R. Goodrich joins Procter & Gamble's products research department of the foods division.

A. G. McCalla from Dean, Faculty of Agriculture, University of Alberta, to Dean, Faculty of Graduate Studies.

Richard L. Markus appointed director, fundamental research division, New York laboratories of Fritzsche Brothers.

Lowell E. Netherton now chief chemist, Victor Chemical Works, succeeding the late **Willard H. Woodstock.**

Bernard L. Oser promoted from vice president and director to president and director, Food and Drug Research Laboratories.

I. A. Sirko to Molinos Nacionales C. A., Puerto Cabello, Venezuela, as chief chemist.

Frank W. Warren appointed sales manager, mid-Atlantic region, Merck & Co.

D. H. Wilson unanimously elected president, Millers' National Federation.

• • • Patter

The 62nd Annual Technical Conference and Trade Show of the Association of Operative Millers will be held on May 5, 6, 7, and 8, 1958, at the Hotel Pick-Nicollet, Minneapolis. Topics that will be presented include: mill productivity study; bulk loading, transportation, and handling; insect-resistive packaging; miller's role in expanding the markets for the miller's produce; and management development. A centennial of milling progress will be shown in 100 exhibition booths of equipment and supplies for the milling industry.

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Corn Products Refining Co. recently donated a nuclear magnetic resonance instrument to the Illinois Institute of Technology. This machine utilizes nuclear magnetic resonance to determine the amounts of moisture present in many materials.

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The Nebraska Bakery Production Club held its March 15 technical session in the Persimmon Room at Hotel Castle, Omaha. Robert G. Dibble, Interstate Bakeries Corp., Kansas City, spoke on "Production flow . . . bread and rolls." Leslie F. Sheffield, chief, division of wheat development, Nebraska Wheat Commission, Lincoln, explained the purposes and operation of the commission and how its interests are related to those of the milling and baking industries. He also showed color slides of the International Trade Fair held last year in Cologne, Germany.

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"Let's Eat Outdoors," a guide to outdoor eating, will be featured in 24 one-fourth pages in the June 28 issue of **Saturday Evening Post.** Offering help in planning backyard parties, picnics, and camping, it includes more than 86 individual recipes and menu suggestions, with many two-color and four-color illustrations. Firms cooperating in the project are American Dairy Association, Dixie Cup, General Mills, Stokely-Van Camp, Coleman Stoves, Hormel, McCormick-Schilling, Nestle, and Corn Products Sales Co.

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Royson "Identicharts" record on strip charts from a remote point the exact time or sequence of conditions occurring during process control and test work. They are said to make the job of interpreting charts more accurate after the record has been made and to eliminate the need for someone to watch charts and make identification marks; also, to be accurate and reliable, not interfering with or obscuring the recording procedure.

"Identichart" models are described and illustrated in a folder, together with related equipment. Model RI-1 prints a 6-digit number and can be adjusted to repeat the same number or advance one number with each printing; RI-2 prints date and time of day to the nearest minute; RI-3 prints a number or letter that is remotely selected for identifying range, chart speed, channel number or other variations; RI-4 automatically counts and then at some particular time prints the count on demand. Write Royson Engineering, Hatboro, Pa., for full details.

A.A.C.C.

LOCAL SECTIONS

Niagara Frontier Section will meet May 17 for a guided tour through the new Sir Adam Beck Hydro-electric Power Station, Queenston Heights, Ontario. A Saturday was chosen so the entire families of members will be able to participate in the tour.

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Northwest Section elected Harry Obermeyer as chairman, Robert Pickenpack as vice-chairman, Ray Anderson as secretary, and Edward Liebe as treasurer for 1958-59.

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New York Section met on April 15 at the Brass Rail, New York, for Ladies' Night. Joan Swift and Willard A. Pleuthner, of Batten, Barton, Durstine and Osborn, led a brainstorming session on "How can wives help their husbands be more successful in business?"

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Pioneer Section met at the Lassen Hotel, Wichita, on March 21-22. New officers elected were Claude Neill, chairman; Wayne V. Parker, vice-chairman; and Wayne F. Samuelson, secretary-treasurer.

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Lone Star Section is planning a Crop Report meeting on July 19 at the Huckins Hotel, Oklahoma City, and a joint meeting with the Operative Millers on September 19-20 at Lake Texoma Lodge. Present officers are: chairman, A. A. Rohlfe, Quaker Oats Co., Sherman, Texas; chairman-elect, George W. Schiller, Pillsbury Mills, Enid, Okla.; and secretary-treasurer, E. A. Vaupel, Food Industries Co., Dallas.

At its spring meeting on March 15, the section heard Wendell Reeder describe a new, quick, and accurate procedure for calcium determination. Glenn Findley gave a resume of the various technical papers presented at the A.S.B.E. meeting in Chicago. Fred T. Dines, president, Western Grain and Supply Co., Amarillo, described new methods and equipment for aeration and fumigation of grain in storage elevators. M. E. Brown, Texas A&M Experimental Station, presented a paper on microscopy in the quality control of feeds.

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Chesapeake Section installed J. E. McGinnis, Standard Brands, Inc., Baltimore, as vice-chairman, and Edith A. Christensen, Grain Division, Agricultural Marketing Service, Beltsville, as secretary-treasurer at its April 24 meeting. Bob Laster, Joe Lowe Corp., spoke on "Prepared mixes in commercial baking."

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Kansas City Section elected new officers at its March 19 meeting. Chairman is Boyce W. Dougherty, Commander-Larabee Milling; vice-chairman is Lester Fischer, Rodney Milling; and secretary-treasurer is Robert T. Craig, Bay State Milling.

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The **Northern and Southern California Sections** will hold their annual joint meeting May 9-10 at The Hacienda in Fresno, California. The meeting will open at 6:30 p.m., Friday, May 9, with a cocktail party and dinner. The Saturday session will be devoted to the presentation of several papers and a short business session. After a group luncheon, the meeting will adjourn about 3:00 p.m.

OVERSEAS REPORTS

• • • England

The new Director of Research to the British Baking Industries Research Association, Chorley Wood, succeeding J. B. M. Coppock (who relinquished this post to become Director of Research to Spillers, Ltd., on January 1), is G. A. H. Elton, D.Sc., Ph.D., F.R.I.C. Dr. Elton will take up his appointment on May 1. He is a newcomer to the field of cereal science, and at 32 one of the youngest men appointed to a post of this responsibility in any British research association. After taking an external London General B.Sc., he commenced his career as a research chemist on the staff of PATRA (The Printing and Allied Trades Research Association), and continued evening studies at the Battersea Polytechnic in South-West London. Research work on theoretical aspects of the stability of colloid systems, conducted in the course of these studies, formed the basis of a thesis which gained him an internal Ph.D from London University and an appointment as lecturer in the Department of Chemistry of Battersea Polytechnic. Promotion to a senior lectureship followed and, subsequently, the post was recognized as a Readership in Applied Physical Chemistry by the University of London. In January 1956 Dr. Elton was awarded the degree of D.Sc. by this University.

During some ten years spent on the teaching staff of the Polytechnic, Dr. Elton trained many postgraduate students for higher degrees and published about fifty papers, mainly in the fields of colloid science and rheology. His rheological studies, concerned with suspensions of mixtures of inorganic solids, will clearly form a convenient bridge to his forthcoming interest in the biological systems basic to baking and confectionery. He has also been engaged, on behalf of the Ministry of Supply, in studies on aerosols, fog dispersion, and water pollution.

Dr. Elton's colleagues in the field of cereal science, both in the United Kingdom and throughout the world, will wish him every success in his new appointment and will look forward to an early opportunity of making his acquaintance.

C. R. Jones

Editor's Note: We wish to again call your attention to the meetings of the Arbeitsgemeinschaft Getreideforschung e. V. scheduled for May, June, September, and October. The Starch Conference has just taken place (April 22-25) and the Cereal Chemists' meeting will be held June 10-12. All meetings will be held in Detmold, Germany and all interested parties are invited.

You are also reminded of the dates for the first annual convention of the Canadian Institute of Food Technology, June 12-13 in the Queen Elizabeth Hotel, Montreal. For more complete information contact J. H. Hulse, Canadian Institute of Food Technology, P.O. Box 62, Postal Station "K", Toronto 12, Ontario.

the President's Corner

news of the association

BUSINESS SESSION

11:00 a.m., April 8, 1958

President W. B. Bradley opened the annual business meeting of the Association at 11:05 a.m. Wednesday. A brief review of business conducted at the preceding meeting in San Francisco was presented and accepted. Reports of the Board of Directors, the Treasurer, Editors, and most of the standing committees were accepted as published in the April, 1958, issue of CEREAL SCIENCE TODAY. The tellers presented the votes cast for candidates in the recent election in which D. B. Pratt, Jr., was chosen President-Elect, Marjorie Howe, Treasurer, and I. Hlynka a member of the Board of Directors. President Bradley also indicated that Jefferson Schlesinger had been selected by President-Elect Brooke for appointment as a Director for the coming year. W. F. Geddes presented an oral report of his participation on behalf of A.A.C.C. in activities of the Food Protection Subcommittee of the Committee on Foods and Nutrition of the National Research Council. Because of the interest in this report by many among the membership, Oscar Skovholt urged publication of the report in full.

Under "Unfinished Business," R. C. Sherwood reviewed proposed changes in the By-Laws of the Association and moved for acceptance of the changes as submitted by mail to the membership on February 7, 1958. Discussion of the proposals dealt only with the increases in subscription rates for CEREAL CHEMISTRY and in dues for all classes of membership. The motion carried with no dissenting vote from the approximately 120 members present. A quorum required the presence of 55 members.

Under "New Business," the names of John C. Baker and C. H. Bailey, following unanimous recommendations by the Board of Directors, were presented for approval as Honorary Members of the Association. Again, the action was taken with no dissenting vote. President Bradley indicated that the conferees would be notified as soon as possible (see below for further details).

Meeting adjourned at 11:58 a.m.

JAMES W. PENCE, *Secretary*

Observations

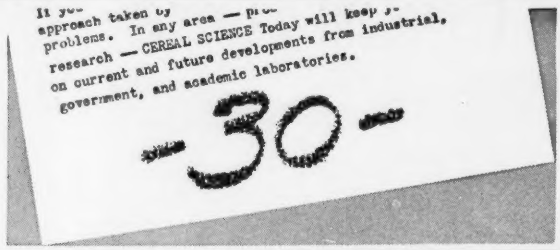
It was noted that a certain club in Newport, Kentucky, had a very large cereal chemist membership. The club dues must be reasonable to have such a large number of chemists on its membership roster. What is a carrousel? We're curious since so many chemists spoke highly of it. Speaking of curiosity brings to mind the question, "What was down the basement at the Hartwell Country Club?" We observed many Briar Hoppers hoping down there. We are mighty glad Jockey Giertz brought his horse in a winner; such horsemanship denotes hours of practice. It is reported the girls saw a million dollar stud! Was Giertz on this one? Brooke and Pratt seen in heated discussion with Bradley; no doubt the newcomers were getting the low down from the old pro. The convention wisecrackers said the chemists from the Indian territories elected Marjorie. When asked to vote they raised their hand and said "Howe." We were glad to see Jan the Miller on hand as usual. The blotters we've been playing bridge with the past month are now discarded. The conventioneers were glad to hear from Sam Trentz aboard Sputnik No. 2. By now he must be grounded according to the papers. By the way, as the old saying goes, "Who is Sam Trentz?" Well, all of us back to school, according to our committee of sanitizers. It's rumored we don't know a rodent hair from a confused flour beetle's antenna. There are so few Republicans left down our way that we find a great deal of pleasure when Truman so completely contradicts himself. The diplomatic immunity of a "has been" not withstanding. Mills won the Speed Award and Fischer the Safety Plaque in the race from Cincinnati to Kansas City; Mills was first; Fischer, last. Mills took advantage; he elevated his landing gear before reaching the Cincinnati city limits.

Send us a protein sometime; we can show both speed and safety. We must go study our rodent hairs now and "Oh, yes, who is Sam Trentz?"

Jim Doty

DOTY
Laboratories

1435 Clay St.,
North Kansas City 16, Mo.



A BACKWARD GLANCE

At every scientific meeting there is much more discussion of technical matters than appears on the formal program. Indeed, it is this sort of exchange of information that really makes meeting attendance worthwhile. It is not likely that the recent meeting in Cincinnati was any exception. Much of the informal technical program consists of material that is not confidential, but may not be regarded as sufficiently extensive or complete to warrant formal presentation or publication.

It is in this area, the "hall conference" area, that many worthwhile and indeed valuable bits of information are collected and brought back to the laboratory. It is this type of service that CEREAL SCIENCE TODAY could perform month after month if only individual members would drop us a note describing some of their experiences and techniques they use or have used to accomplish specified aims.

The editors of this journal wish to again call your attention to the opportunity that exists within these pages to air your views on any technical subject or to present helpful bits of information to your colleagues on laboratory techniques, etc., without the rigors of formal presentation and review. The more individuals who take part in this type of collaboration the greater will be the benfits to all.

APPERT MEDAL TO W. F. GEDDES

Dr. W. F. Geddes will receive the Nicholas Appert Medal at the Annual Meeting of the Institute of Food Technologists to be held in Chicago May 26-29. This award is one of the highest honors given by the I.F.T. and is indicative of the outstanding qualities of scientific ability on the part of the recipient.

Those of us who have known Bill Geddes for a number of years will not be surprised at this anouncement, but will be most pleased to know that such recognition is being paid to him.

Our own Association paid similar recognition to Dr. Geddes in 1950 by awarding him the Thomas Burr Osborne Medal. He has been Editor of *CEREAL CHEMISTRY* since 1944 and has actively participated in all of the Association's publishing endeavors since that time; these include both Monographs and a number of editions of *Cereal Laboratory Methods*. We only wish it were possible for all of us to be with him in Chicago on the night of the award presentation, as he carries with him our very best wishes.

COVER PHOTOS

Over the past two and one-half years, the editors of this journal have tried to present on the cover of each issue a picture of interest as well as artistic achievement. Sometimes we have succeeded; sometimes we haven't. We would like to urge every member who has a photograph possibly possessing the qualities needed for a cover illustration to submit it to us for our consideration. Perhaps among you are a number of amateur photographers who would like an opportunity of showing off an especially good job. We would like to give you this opportunity.

OPEN THE DOOR, JIM!

A common topic of conversation at conventions often concerns the snail-like elevator service. Cincinnati was a rare exception although the hotel boasted of 29 floors. Automatic elevators was the answer, guided by an electronic brain that even the cereal chemist couldn't outsmart. It was rumored that one prominent AACC member was about to condemn the entire system because the door wouldn't close until a fellow passenger pulled him away from the "Open Door" button!

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